

CEYLON.



REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE PERIOD

JULY 1, 1912, TO DECEMBER 31, 1913.

Columbo:

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1914.

DEPARTMENT OF AGRICULTURE.

REPORT OF THE DIRECTOR OF AGRICULTURE FOR 1912-13.

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INTRODUCTION.

I HAVE the honour to submit the annual report of the Department of Agriculture for the period July 1, 1912, to December 31, 1913.

2. I submitted my proposals for the organization of the Department on January 8, 1913. These were considered at a meeting of the Executive Council on April 21, at which I was present. They received the sanction of the Secretary of State on July 16, and were published in Sessional Papers XIII. and XXXI. of 1913.

CHANGES IN AND MOVEMENTS OF STAFF.

3. Dr. R. H. Lock, M.A., Sc.D., Assistant Director, Royal Botanic Gardens, resigned his post with effect from November 20, 1912.

4. Mr. D. S. Corlett assumed duties as Superintendent, Peradeniya Experiment Station, on February 3, 1913.

5. Mr. E. E. Green, F.E.S., Government Entomologist, resigned his post with effect from February 1, 1913. He was succeeded by Mr. A. Rutherford, M.A., B.Sc., on March 8, 1913.

6. Mr. L. E. Campbell, B.Sc., A.I.C., assumed duties as Rubber Research Chemist on May 28, 1913.

7. Mr. H. F. Macmillan, F.L.S., F.R.H.S., Superintendent of Botanic Gardens, returned from leave and resumed duties on June 23, 1913.

8. Mr. G. Bryce, B.Sc., assumed duties as Assistant Botanist and Mycologist on December 1, 1913.

9. Mr. N. Wickramaratna, Agricultural Instructor, was appointed Secretary to the Board of Control, Co-operative Credit Societies, with effect from April 1, 1913.

10. Consequent on the appointment of Mr. G. E. Punchibanda as Nurseryman, the following promotions and appointments were made with effect from May 1, 1913 :—

Mr. R. D. Peter, Second Upper Gardener, to be First Upper Gardener.

Mr. D. W. K. Goonewardena, Third Upper Gardener, to be Second Upper Gardener.

Mr. W. P. Jasinha, to be Third Upper Gardener with effect from July 1, 1913.

11. The following appointments were made in the Clerical and Garden Staffs of the Department :—

Mr. A. S. Munasinha, Clerk to the Superintendent, Botanic Gardens, August 1, 1912.

Mr. E. de Alwis, Museum Assistant, December 1, 1912, *vice* Mudaliyar W. de Alwis, resigned.

Mr. D. A. W. Ranasinha, Assistant Conductor of the Henaratgoda Gardens, March 1, 1913.

Mr. L. B. Kapuwatte, Clerk, Head Office, April 1, 1913.

Sangaran, Gardener, Stock Garden, Colombo, to be Rubber Tapping Conductor, Experiment Station, Peradeniya, July 1, 1913.

Mr. R. D. Weerasinha, Foreman, Peradeniya Experiment Station, to be Conductor, Coconut Trial Grounds, Chilaw, with effect from July 1, 1913. He was succeeded by Mr. T. B. Ranaraja on July 1, 1913.

Mr. S. J. de Silva, Assistant Foreman, Peradeniya Experiment Station, resigned his post with effect from July 1, 1913. Mr. W. H. Weerasekera succeeded him, July 1, 1913.

Mr. C. D. W. Kannangara, Clerk to the Superintendent, Low-country Products and School Gardens, July 10, 1913, *vice* Mr. W. B. Nonis, transferred to Colombo Museum.

Mr. R. Udalagama, Librarian, July 10, 1913, *vice* Mr. H. A. Perera, transferred to Matale Kachcheri.

Mr. S. V. Solomons, Clerk, Public Works Department, Clerk to the Board of Control, Co-operative Credit Societies, July 14, 1913.

Mr. P. B. Ulapone, Assistant Foreman, Peradeniya Experiment Station, August 1, 1913.

Mr. L. S. Bertus, Field and Laboratory Assistant to the Botanist and Mycologist, August 5, 1913.

Mr. E. P. Rupasinha, Clerk to the Superintendent, Low-country Products and School Gardens, August 15, 1913, *vice* Mr. A. D. L. de Z. Jayatilleke seconded for service as an Agricultural Instructor.

Mr. R. V. Naganathan, Clerk, Head Office, September 1, 1913.

Mr. L. B. Caspersz, Field and Laboratory Assistant to the Entomologist, October 13, 1913.

Mr. J. E. Lobendhan, Clerk, Audit Office, Colombo, Accounts Clerk, Head Office, November 1, 1913.

12. Mr. C. G. de Alwis, Photographer and Draughtsman, resigned his post July 1, 1913.

13. Mr. J. E. P. Maldeniya resigned his post as Clerk to the Superintendent, Experiment Station, Maha Iluppallama, September 1, 1913.

14. The Department is not yet in complete working order, as there were three offices still vacant at the close of the year, namely, those of Superintendent of Experiments, of Tobacco Planter, and of Curator of the Royal Botanic Gardens.

15. At the same time the Department as a whole has maintained a high level of activity, and I think we are able to report good progress for the period under review.

16. It is difficult to say what has been the most conspicuous feature of the work of the year, but certainly the most gratifying is the cordial relations which have been maintained with the representatives of both branches of Ceylon agriculture, namely, the low-country industries and the hill-country industries; and the close touch we have succeeded in keeping with the various communities and the problems with which they are concerned.

17. Particular attention has been given to the question of improvement in cultivation of coconuts, of paddy, of cotton, the preparation of rubber, tea pests, the application of the principles of dry farming to Ceylon, the establishing of the co-operative credit societies in the villages.

BOTANY AND MYCOLOGY.

18. These are now grouped together in one division under Mr. T. Petch, Botanist and Mycologist, assisted by Mr. G. Bryce. Though the services of the Mycologist are in constant demand, identifying and advising, no outbreak of disease of a serious character among plants occurred during the year. Very little escapes the vigilance of the Ceylon planter, and largely to this fact may be attributed the happy immunity from serious disease and insect attack our plantations enjoy. Application to Peradeniya is made as soon as any suspicious symptoms are noticed.

19. The Herbarium has been separated from the Gardens, and is now under the control of the Botanist and Mycologist.

CHEMISTRY.

20. Work in this division, irrespective of rubber research, has been mainly confined to the examination of rubber samples, and advice as to the manuring of tea, rubber, and coconuts. Schemes of manuring have been prepared for the Chilaw and Negombo Coconut Trial Grounds, and other coconut experimental plots established by private planters.

BOTANIC GARDENS.

21. The Division of Botanic Gardens, embracing the Royal Botanic Gardens, Peradeniya, Hakgala, Henaratgoda, and Nuwara Eliya, has been placed in charge of Mr. Macmillan as Superintendent. Work at the Peradeniya Gardens, the most important of the group, has been somewhat hampered by lack of labour, and in the early part of the period under review, when the organization of the Department was in progress, by the staff being very short-handed, Mr. Petch performing the duties, as far as one man was able, of four officers. I am glad to say the work of the division has now settled down satisfactorily.

SCHOOL GARDENS.

22. Accompanied by the Superintendent, I visited a large number of school gardens during the year. At one time it appeared to me we might use them for the purpose of experimenting with economic products, such as cotton, but the attempt did not prove successful. The gardens are well adapted for introducing vegetables and fruit trees, and are being so used to a considerable extent. In one large school we established a system of competition among the boys with such success that I only regret our resources in the way of funds for prizes did not permit us to extend it to other schools.

A Junior Agricultural Reader by Mr. C. Driberg was introduced during the year into the Government vernacular schools, and serves to amplify the informal lessons being taught in the gardens.

School gardens will attain their full scope when the teaching of agriculture in the vernacular schools, by teachers trained in the Central Agricultural School to be established at Peradeniya, becomes general.

COCONUTS.

23. On September 1, 1913, the price of copra touched Rs. 105.50 per candy, the highest price recorded in Ceylon. The high price of the product has stimulated interest in experimental cultivation.

24. On December 16, 1912, I met a number of prominent coconut planters in the Legislative Council Chamber at Colombo, when it was decided that coconut trial grounds should be established in various parts of the Island. One such has been started at Chilaw, on the Millicent estate belonging to the Martin Coconut Estates of Chilaw, Limited, with trees in bearing, to test the effect of various manures, of dry-farming methods, irrigation, and of clean weeding. Another has been established at Negombo on land belonging to Mudaliyar A. E. Rajapakse, with the object of ascertaining by what method young trees can be brought most quickly into bearing. We have received offers of trial plots from various other landowners, of which we hope to avail ourselves when we feel we can take them in hand. This will be the case when the Superintendent of Experiments is appointed.

25. I believe that the greater part of our so-called dry zone could be put under coconuts, and that the present output of copra in Ceylon is capable of enormous increase. In this connection our trials at Maha Iluppallama are timely, and the records by Mr. Harbord in his report annexed of the results so far reached go to strengthen the belief above expressed.

26. A great deal of valuable experimental work has been and is being carried out by private enterprise, notably by Mudaliyar A. E. Rajapakse of Negombo, and I very much regret that, being short-handed, we have not been able to study the results which he and other private gentlemen are willing to place at our disposal for the benefit of the public. We shall, I trust, be able in the course of this year to give them the required attention.

TEA.

27. As regards this product, the Department and the Committee of Agricultural Experiments have been chiefly concerned with the ravages of shot-hole borer referred to by Mr. Rutherford, the Government Entomologist, in his report annexed. From the various discussions the following points have been brought out:—That the Plant Pests Ordinance, No. 6 of 1907, as an instrument to prevent the spread of shot-hole borer, is ineffective; new regulations under section 3 of Ordinance No. 5 of 1901 have been drafted; that as we are unacquainted with the life-history of the pest, the Department is not in a position to speak with authority on preventive and remedial measures that should be adopted, and that the experience of planters is to some extent conflicting; lastly, that the life-history of the pest should be studied by an entomologist detailed exclusively for that work.

RUBBER.

28. A considerable amount of interest has been taken in the method of curing rubber by the application of smoke to crude latex, the most notable of the various apparatus being that of Mr. Wickham. With what he calls his B model he has succeeded to a great extent in reproducing mechanically the methods of the rubber curers of the Amazon valley.

29. This apparatus was sent to Peradeniya about five years ago, and when Mr. Wickham was here last year it was set up. On October 22, 1912, Mr. Wickham superintended the curing of a small block of rubber, the first block of hard cure to be prepared by this method in Ceylon.

30. On June 24, 1913, a consignment of 53½ lb. of Wickham block was sent to the Imperial Institute for report, but no report has as yet been received. A small parcel sent to Mincing Lane in September was very favourably reported on by buyers and manufacturers, and at the request of Messrs. Lewis & Peat a parcel of 5 cwt. prepared at Henaratgoda and Peradeniya was despatched on September 24 last.

31. Three cases of this sold for 3s. per lb. and two cases for 3s. 0½d., the price of fine Para on the day of sale being 3s. 1½d. The lots were bought for experimental purposes by various manufacturers.

32. As a result of the favourable reports received, other machines for curing rubber by smoking the latex have been devised by various people in Ceylon.

33. In several of these cases the advice and assistance of the Department of Agriculture have been sought and given.

34. Mr. Wickham did not invent a new method of curing rubber, but endeavoured to imitate the Amazon method. Some of the new inventions aim at completely new methods, which, though they may be an improvement upon, are not yet those of the Amazon now most favoured by the market.

THE SLUMP IN PRICE.

35. About the month of February the price of plantation rubber began to drop, until in September it reached 1s. 11½d. per lb., at about which figure it remained some time. An upward movement has recently taken place. The fall in price was not shared to the same extent by hard-cure Para. The disparity was no doubt due to some extent to financial causes, but from the great volume of discussion to which the crisis gave rise two facts seem to emerge: one is that for certain purposes fine hard Para is more durable than plantation; the other that the price of plantation has been prejudiced by lack of uniformity in quality. The task of planters who desire the restoration of plantation rubber to its former position of equality with the Amazon product is first to determine by what methods plantation rubber should be prepared, and, having ascertained that, to try and bring the whole industry to adopt those methods. This is what is comprehended in the expression Standardization of Plantation Rubber.

RUBBER RESEARCH.

36. As a step in the direction of standardization, the Department of Agriculture, in co-operation with a portion of the rubber planting industry, has undertaken the investigation of various methods of preparation to ascertain which of them produces the best quality of rubber after vulcanization. Tests for quality must take place after vulcanization, not before. The work of preparing the samples according to a scheme drawn up by the Imperial Institute, the Department of Agriculture, and the Rubber Research Committee, and designed to cover all the ground of plantation practice, has been entrusted to Mr. L. E. Campbell, B.Sc., A.I.C., who arrived in the Island from the Imperial Institute on May 28, 1913, and since that date has been engaged at Gikiyanakanda and Peradeniya.

37. On November 4 and 19 last Mr. Campbell sent to the Imperial Institute his first batch of 80 samples. The vulcanizing and testing is to be done at the Imperial Institute with plant provided by the Ceylon Government, the samples being afterwards submitted to manufacturers. These measures should lead us to a practical issue.

38. The result of the present crisis in the market will probably be to put plantation rubber in an impregnable position. The African rubbers, nearly all of which are derived from forests, cannot, I think, survive the present low price. Ceara rubber produced in the plantations of East Africa will also probably disappear from the market, because the yield of *Manihot* being very much less than that of *Hevea* the cost of production is greater. The Amazon industry itself may, indeed, be doomed, the cost of production of the wild product being at least twice as much as the cultivated, in some cases three times. These circumstances point to plantation *Hevea* eventually being left in sole possession of the market.

RUBBER PLANTING.

39. Interest in planting has chiefly centred round the question of wider spacing of Hevea, and of thinning out estates that are found to be too closely planted. At the meeting of the Committee of Agricultural Experiments held at Peradeniya on November 7, 1912, when the question came up for formal discussion, the opinion was expressed that thinning out should be effected with regard solely to the merits of individual trees irrespective of regularity in the rows, weedy trees being cut out to make room for the development of good trees. Experiments at Henaratgoda have shown that the Hevea trees there take full advantage of their opportunity if given room in one direction to develop foliage. In this respect the Hevea resembles the coconut palm, whose appetite for light and air compels it to seek them regardless of symmetry of growth.

40. Opinion is also settling down to wider planting. The plantation unit of calculation is the acre, not the tree. Close planting gives a greater return in the early years, given similar conditions of climate and soil. The case for wider planting may be stated thus: (1) At what age will the yield per acre of a plantation planted, say, 20 by 20 overtake that of another planted 15 by 15? (2) In a given period of, say, 15 years would the total yield of rubber per acre be greater by planting 20 by 20 or 15 by 15? Retrospectively the boom and slump of market operated in favour of close planting.

CACAO.

41. The success which has attended our cacao plantation at Peradeniya is one of the most satisfactory features of the year's work as far as experiments go, and I feel sure our cacao plantations would repay closer study than they are now receiving on the part of planters.

COTTON.

42. During the season 1912-13 fifty small plots in various parts of Ceylon were placed under cotton by the Department of Agriculture and the Agricultural Society, the variety chosen being Allen's Long Staple American Upland. Of these, only one plot of $1\frac{1}{2}$ acre at Ambalantota, in the District of Hambantota, in the south-east part of the Island, was satisfactory. This plot yielded at the rate of 1,043 lb. of seed cotton per acre.

43. Planting took place in October, 1912, the seeds being sown 20 inches apart in rows 3 feet apart. Flowering took place in the end of December, and picking began early in March.

44. The land was placed at the disposal of the Society by the Assistant Government Agent of Hambantota, the experiment being carried out under the supervision of Mr. Jayasuriya, Agricultural Instructor, with the co-operation of Amerasekera Mudaliyar of Magam pattu.

45. The crop was ginned in Colombo, and two bales of lint sent to Liverpool sold for $7\frac{1}{2}d.$ and $9\frac{1}{2}d.$ per lb., the price of American middling at the same time being $7\frac{3}{4}d.$ The cotton was grown on jungle land, and cost, including clearing, freight, and other charges, Rs. 48 per acre to produce. The gross proceeds per acre, including sale of seed, were Rs. 162, the nett returns Rs. 54.

46. The same piece of land has been sown again with cotton this season, the crop at the time of writing looking even better than that of last year. In view of the success of the trial, offers of Crown jungle land for cotton growing were made to chena cultivators on special terms by the Assistant Government Agent, and applications were received from various private individuals in the locality, but too close on to the October rains (1913) to permit of time for all to be planted. Thirty-one acres were, however, taken up at a nominal rental of Re. 1 per acre and sown; reports as to the condition of the crops being now very satisfactory.

47. Hambantota has an average annual rainfall of 36 inches, and what is most important for cotton, a fairly reliable dry season in March for harvest.

48. In the case of the other plots, unseasonable (from the point of view of the cotton planter) rains either stimulated the growth of leaf and stalk at the expense of boll, or dashed the crop when it opened.

49. For the October and November sowing the agents of the British Cotton Growing Association distributed to different parts of the Island seed sufficient for 380 acres, an indication of the endeavours that are being made to establish a cotton industry in Ceylon. So far as they have gone the trials above referred to confirm the results previously obtained at Maha Iluppallama, namely, that the main portion of our so-called dry zone is unsuitable for cotton as a staple crop.

CARAVONICA COTTON.

50. On April 23, 1913, I visited a plot of Caravonica cotton at Galgamuwa planted by a private firm, Mr. Driberg, Mr. Corlett, and Mr. Harbord being with me. The plot was stated to be $4\frac{1}{2}$ acres in extent, and had yielded 1,260 lb. of seed cotton the first year, i.e., about 280 lb. an acre. The expenditure, including clearing, had been Rs. 753. Estimating the value of the seed cotton at $2d.$ a lb., a gross return of Rs. 157.50 was shown. The trees had not been pruned back after the crop had been taken, and the new bolls were very small. We observed a caterpillar attacking the flower buds, the boll worm (*Earias fabia*) and the stainer (*Dystercus cingulatus*) all at work. On the whole, the trial seemed to us disappointing.

TOBACCO.

51. The Tobacco Planter and Curer not having as yet been appointed, we were not able to undertake during the year any trials, or begin upon, what must be our first task with this product, an endeavour to relieve the situation in Jaffna by finding a market in the place of Travancore, from which the chewing tobacco of the peninsula is being shut out.

52. A Colombo firm, Messrs. Freudenberg & Co., has opened a factory at Teldeniya, buying leaf from local small growers and curing it by the Sumatra system of bulking, fermenting, and re-stapling. Wrapper and filler leaf are produced and sent to Hamburg, or manufactured into cigars for the Ceylon market. The firm has under consideration the extension of its enterprise in the Teldeniya and in the Matale Districts.

PADDY.

53. This product has been the subject of much discussion during the year by the Committee of Agricultural Experiments, the Board of Agriculture, and the press; experiments have been in progress by the Department at Maha Iluppallama and Peradeniya and by the Ceylon Agricultural Society.

54. The question is an involved one, in which this Department is not alone concerned. Poverty of the cultivator is one of the chief hindrances to improving the condition of the industry. A beginning has been made in the direction of lightening this load of the *goiya* by the starting of co-operative credit societies, described elsewhere in this report. But the welfare of the paddy crop is largely bound up with the water supply, and it suffers either from a scarcity due to an insufficient quantity in the village tank, or from an excess due to floods.

55. After a careful investigation of the field of experimental cultivation, we have decided to concentrate for the present chiefly on an endeavour to introduce a system of growing a green manure crop between the two paddy crops, and we have in preparation a scheme for demonstrating this year in each Province the value of growing green manures.

56. A considerable amount of public attention has been directed to the extension of the area under paddy with a view to cheapening the price of rice consumed by coolies on estates, but no concrete proposals have as yet been formulated. There is no doubt about the fact that the area of paddy cultivation in Ceylon could be increased under some of the large tanks.

THE PATANAS.

57. With the object of finding a product suitable for our waste patnas, a small plantation of black wattle, *Acacia decurrens* var. *mollissima*, has been laid out at Hakgala, the plants being raised from seed obtained from the South African Department of Agriculture. This is the variety which yields the wattle bark of Natal. Arrangements have been made for laying out trial plots of maize, tobacco, and lucerne.

CO-OPERATIVE CREDIT SOCIETIES.

58. The report of the Secretary is attached. Wherever I have addressed meetings I have met with unanimous approval from all classes of the community of the principles of the movement, followed by the formation of societies.

59. This has also been the experience of Mr. Driberg and Mr. Wickramaratna. These principles were not at first understood, but when explained they are acknowledged to be sound. Village cultivators are weighted down with a burden of debt, and unless we can relieve that burden we cannot expect to make much headway with the introduction of improved methods of agriculture. Co-operative credit societies afford that relief. Though new to Ceylon, the movement is being adopted by all civilized peoples, and is certainly bound to take root and grow here.

COMMITTEE OF AGRICULTURAL EXPERIMENTS.

60. The Committee has been strengthened during the year by the addition of several representatives of low-country products, and now numbers 28 members, as compared with 14 in 1912. Nine meetings have been held during the year and a half under review. Among the subjects which have occupied its attention has been the application of explosives to planting. Several illustrations of the process of holing by dynamite were given at the Experiment Station, and on July 10, 1913, a demonstration was organized in the Royal Botanic Gardens, at which a representative of Messrs. Hamburg Nobel Explosive Co. performed some holing and subsoiling operations before about 300 members of the planting community. An agent of Messrs. Glasgow Nobel Explosive Co. subsequently visited Peradeniya in connection principally with stump extraction by explosives. A Bulletin was issued by the Department summarizing the trials. The public have become acquainted with the general principles and practice of the system, but have not as yet adopted it to any great extent. It is labour-saving and effective as a means of holing for large trees like rubber and coconut, but it is too expensive when the spacing is small as with tea. For subsoiling—breaking hard pan—the radial action of the explosions is too limited for the system to be applied over large areas except at considerable expense. It can be used as an aid to the axe and mattock in extracting tree stumps, but not by itself.

61. A sub-committee has been formed to manage the coconut trials, and a technical committee independent of, but working in sympathy with, the Committee of Agricultural Experiments is being established to control rubber research.

62. The ravages of shot-hole borer in tea have been repeatedly discussed. I refer to this under another heading. Among other subjects to which the Committee have devoted attention may be enumerated the following:—Rubber spacing, thinning out, manuring, discolourization of crepe, smoke curing, tapping methods, bark renewal, movement of starch, sterilization of manures, the Maha Ilupallama coconut experiments, coconut trial grounds, the Peradeniya cacao experiments, manuring tea, oxalis pest, the improvement and extension of paddy cultivation, fodder grasses, green manures, labour, the College of Tropical Agriculture, the London Rubber Exhibition, the Java Exhibition.

PUBLICATIONS.

63. *Annals*.—Three numbers of the *Annals* were published during the period, containing the following articles:—

Vol. V., Pt. IV., August, 1912.

Ustilaginæ and Uredinæ of Ceylon. T. Petch.

Notes on Colour Inheritance in Maize. R. H. Lock.

Revisions of Ceylon Fungi (Part III.). T. Petch.

Vol. V., Pt. V., March, 1913.

Termite Fungi: a Résumé. T. Petch.

Papers and Records relating to Ceylon Mycology and Plant Pathology, 1783–1910. T. Petch.

Vol. V., Pt. VI., November, 1913.

An Orchid new to Ceylon. T. Petch.

White Ants and Fungi. T. Petch.

The Black Termite of Ceylon. T. Petch.

Notes on the Brazil Nut Tree in Ceylon. T. Petch.

64. *Bulletins*.—The following numbers were published during the period:—

No. 1.—Hevea: Henaratgoda Experiments, 1911–12. R. H. Lock and M. K. Bamber; September, 1912.

No. 2.—Coconuts: Experiments at Peradeniya. M. K. Bamber; December, 1912.

No. 3.—Stem and Root Borer of Hevea Rubber. E. Ernest Green; January, 1913.

- No. 4.—Hevea : Yields of some Henaratgoda Trees. R. N. Lyne ; May, 1913.
 No. 5.—Cacao : Manuring and Shading. Chairman and Secretary of the Committee of Agricultural Experiments.
 No. 6.—Diseases and Pests Legislation in Ceylon. T. Petch ; September, 1913.
 No. 7.—Coconuts : Experiments at Maha Iluppallama. G. Harbord ; November, 1913.
 No. 8.—The Use of Explosives in Agriculture. H. F. Macmillan ; December, 1913.

65. Articles on the following subjects were contributed to the "Tropical Agriculturist" :—

Mr. R. N. Lyne.—Two Ceylon Problems ; Tobacco Planting in Ceylon ; The All-Ceylon Exhibition ; Hard Cure Para ; Village Industries ; Paddy and Para ; The Wickham Smoker ; Coagulation of Funtumia ; Conference of Coconut Planters ; Retirement of Mr. E. Ernest Green ; The "Tropical Agriculturist" ; College of Tropical Agriculture ; Hedychium : Preparation of Hard Cure Para ; The All-Ceylon Exhibition ; The Hon. Sir Edward Rosling ; The Power of Combination ; Proposed Scheme for a College of Tropical Agriculture in Ceylon ; Back to Tull ; Department of Agriculture ; The Standardization of Plantation Rubber ; Wickham Hard Cure ; The Old Hevea Trees at Henaratgoda ; The Science of Manuring ; Plantation Hard Cure.

Dr. R. H. Lock.—A Rubber Catechism ; A Visit to the First Indigo Factory in Ceylon ; The Nicaraguan Cacao at the Experiment Station.

Mr. T. Petch.—Pink Disease in Java ; Fungoid Diseases of Cultivated Plants ; Roots Disease of Hevea ; Ceara Rubber ; A New Disease of the Ceara Rubber Tree ; Tropical Plant Fibres ; The Introduction of Hevea Brasiliensis into the East ; A New Disease of Tea ; Rubber Free Diseases ; Hevea Seed ; The Introduction of Hevea into Perak ; Tapping Experiments on Hevea ; Tapping Experiments on Ceara ; The Fundamental Principles of Rubber Tapping ; The Nomenclature of Rubber Tapping ; A Disease of Plantains ; The Slope of the Tapping Cut ; The Effect of Manuring on the Growth of Hevea ; The Flower of the Coconut ; The Water Hyacinth as a Fibre Plant ; "Pochote" : A new Kapok Plant ; The Rhinoceros Beetle ; Tarring Pruning Cuts on Tea.

Mr. E. Ernest Green.—Report on Disease of Paddy Plants at Agalwatta ; Note on Experiments with Mr. Beddewela's Termite Mixture ; Report on Insect Pest on Adiantum Ferns.

Mr. H. F. Macmillan.—Cape Gooseberry ; The Durian ; Sisal Hemp ; Ceylon Gooseberry ; Bignonia Magnifica ; Congea Tomentosa ; Calabash Nutmeg ; Mauritius Hemp ; New Zealand Flax ; Cloves in the Spice Collection, Peradeniya Gardens ; Alspice or Pimento.

Mr. A. Rutherford.—An Ant Repellent ; A College of Tropical Agriculture ; Zeuzera Coffea ; Mites ; Carbon Bisulphide as an Insecticide.

Mr. M. Kelway Bamber.—Burning Qualities of Maha Iluppallama Tobacco ; A Green Manure for Tobacco.

Mr. C. Driberg.—Progress Reports Nos. LX., LXI., LXII., and LXIII. ; Annual Reports 1911-12 and 1912-13 ; Annual Meeting held on July 3 at the All-Ceylon Exhibition ; C. A. S. Meeting of September 10 ; Sorghum as a Fodder Crop ; A Village Fair ; Apple Growing in Tasmania ; Anona Cherimolia and A. Palustris ; Litsea Chinensis and Bitter Honey ; Minneri Tank ; The Yoking of Cattle.

Mr. D. S. Corlett.—Coagulation of Funtumia Latex at Peradeniya ; The Object and the Work of the Agricultural Bank of Egypt ; Cotton in Egypt.

66. The following book has also been published :—

Junior Agricultural Reader. C. Driberg.

RECEIPTS AND EXPENDITURE.

67. The expenditure under the various heads of the Estimates for the Financial Year July, 1912, to June, 1913, was as follows :—

	Rs.	e.		Rs.	e.
Salaries ..	88,453	18	Expenses of Agricultural Department ..	549	61
Travelling ..	9,959	12	Cost of drugs ..	82	22
Labour and upkeep, Peradeniya Gardens	16,250	32	Stationery, &c. ..	1,304	74
Labour and upkeep, Hakgala Gardens ..	6,030	5	Co-operative Credit Society :—		
Labour and upkeep, Henaratgoda Gardens	3,452	23	Travelling ..	275	42
Labour and upkeep, Nuwara Eliya Gardens	2,419	79	Incidental expenses ..	52	80
Labour and upkeep, Peradeniya Experiment Station ..	22,503	72	Special Expenditure :—		
Machinery, Experiment Station, Peradeniya ..	1,008	49	Cattle for Experiment Station, Peradeniya ..	1,991	0
Labour and upkeep, Experiment Station, Maha Iluppallama ..	11,438	5	Book cases for Library at Peradeniya ..	662	56
Labour and upkeep, School Gardens ..	3,382	60	Laying out of Gardens attached to District Judge's Bungalow, Nuwara Eliya ..	1,000	0
Upkeep of the Library, Laboratory, Herbarium, and Museum ..	4,548	69	Furniture for Irrigation Department bungalow at Maha Iluppallama ..	376	87
Repairs to buildings ..	686	51			
Illustration of Scientific Journal ..	48	60	Total ..	176,476	57

68. Receipts :—

	Rs.	e.
Head Office (Publications, &c.) ..	482	28
Royal Botanic Gardens, Peradeniya ..	2,406	10
Hakgala Gardens ..	447	25
Henaratgoda Gardens ..	742	64
Experiment Station, Peradeniya ..	18,313	66
Experiment Station, Maha Iluppallama ..	532	32
Total ..	22,924	25

69. To this must be added the value of seeds and plants given gratis to Government institutions from the following gardens :—

	Rs.	e.
Peradeniya ..	1,103	0
Hakgala ..	822	0
Total ..	1,925	0

Peradeniya, April 9, 1914.

R. N. LYNE,
Director of Agriculture

REPORT OF THE BOTANIST AND MYCOLOGIST.

THE Mycologist, in addition to his own duties, acted as Assistant Director from July 29 to August 13, 1912, as Curator, Peradeniya, from July 15 to September 20, 1912, and as Superintendent of Botanic Gardens from September 20, 1912, to June 22, 1913. With the re-organization of the Department, the post of Mycologist has been changed to that of Botanist and Mycologist, and an Assistant Botanist and Mycologist and a Field and Laboratory Assistant have been appointed. Provision has also been made for equipping the laboratory.

2. The extent to which the services of this division have been utilized by the public is indicated by the total number of in and out letters for the eighteen months under consideration, which amounted to 2,529. Consignments of disease specimens for examination numbered 300, of which 136 were Hevea, 69 tea, 22 miscellaneous fungi chiefly from dead or pollarded Hevea, and 12 coconuts. The remaining 61 consignments included 29 species of cultivated plants.

3. Specimens of diseased plants for examination and report were received from Brazil, the Seychelles, India, Burma, Borneo, Java, Gold Coast Colony, Uganda, West Indies, and the Solomon Islands.

4. Visits have been made to the Kalutara, Kelani Valley, Matale, and Gampola districts in connection with the diseases of Hevea, to the Nuwara Eliya District for diseases of tea, Negombo and Moratuwa for diseases of coconuts, and Colombo for diseases of plantains. The total number of miles travelled is 4,530.

5. Lectures on the diseases of Hevea have been given to the Kalutara and Kelani Valley Planters' Associations.

FUMIGATORIUM.

6. The proposed extensions to the Fumigatorium have been postponed, pending the re-arrangement of the buildings on the harbour front. During the last six months of 1912 4,422 cases of tea seed, 384 cases of oranges and lemons, and 252 packages of plants, bulbs, &c., were treated at the Fumigatorium. For 1913 the numbers have been 2,667 cases of tea seed, 1,079 cases of oranges and lemons, and 443 packages of plants. Forty-two cases of tea seed (three consignments) were refused admittance, as the seed was packed in soil.

HEVEA.

7. "Canker" of *Hevea brasiliensis* was rather common during the latter half of 1912, but appears to have been less prevalent during 1913. It has been found that the leaf fall which often follows the fruit disease, and is characterized by the appearance of a dark-brown ring on the leaf stalk, is caused by the canker fungus (*Phytophthora faberi*). Decay of the renewing bark is still common in wet weather; the use of carbolineum plantarium, which has been found to stop this decay in Java, has been recommended, and this substance is now available in the Island. The Assistant Botanist and Mycologist is investigating the nodule formation on Hevea. Other diseases of Hevea have not called for much attention recently.

In dealing with the diseases of rubber trees in bearing, one is handicapped by the fact that the best fungicide available, Bordeaux mixture, is a copper compound, since traces of copper in the rubber are known to turn it tacky. Lime sulphur mixture, which is frequently recommended, has been found useless against a disease caused by *Phytophthora*, as "canker" is. An experiment carried out during the wet months of 1912 would seem to show that the amount of copper salts found in the rubber after spraying with Bordeaux mixture is insufficient to cause tackiness. The trees were sprayed during dry weather. The first heavy rain occurred five days later, and the rubber collected the following day was made into biscuits, which were subsequently analysed. The biscuits contained 0.00016 per cent. of copper, and the scrap 0.003 per cent. The rubber, all in biscuit form, from this row of trees for the next seven months was kept under observation, but no tackiness was noted. At the request of the Kalutara Planters' Association, Hevea "canker" has been placed under the Pest Ordinance.

TEA.

8. On several estates in the Nuwara Eliya District Gray Blight (*Pestalozzia palmarum*) and Bird's-eye Spot (*Cercospora theæ*) caused considerable damage by attacking the partially unfolded buds during the south-west monsoon rains. Additional evidence of the occurrence of *Rosellinia* on buried prunings was obtained.

COCONUTS.

9. Several instances of the occurrence of red spots and decayed patches on the kernels of stored coconuts were brought to notice. Some work has been done on this subject, and it will be taken up fully as soon as possible.

PLANTAINS.

10. A disease of plantains, stated by some to be new and by others to be a well-known phenomenon, has occurred in the Colombo District, where it has caused considerable loss. This is now under investigation. Attention has been called to the disease and methods of treatment by articles in the local press, and a leaflet is about to be issued by the Agricultural Society.

INDIGO.

11. Attempts to cultivate indigo on land which had previously borne the same crop were frustrated by a fungus, which attacked the seedlings as soon as they appeared above ground, scarcely any escaping. Several methods of treatment were outlined, but all were considered too expensive for trial.

MISCELLANEOUS DISEASES.

12. *Rosellinia bothrina*, the tea root disease, has been found to attack camphor.
13. *Tephrosia candida*, now used largely as a green manure, has been found susceptible to the attacks of two tea root diseases, viz., *Rosellinia* and *Poria hypolateritia*. In both these diseases the fungus spreads through the soil and would probably kill the majority of the plants it might meet. It is improbable that the use of *Tephrosia* would introduce either disease, but it might facilitate their spread if they were already present. It has been previously pointed out that patches affected by *Rosellinia* should be kept as bare as possible.
14. In the Kandy District mangosteens were attacked to a large extent by "gamboge disease" in the season of 1913. This appears to be caused by a fungus, which attacks the fruit wall, producing hard patches. There is some reason to believe that the fungus may attack the fruit at a very early stage, and if this view is confirmed, it would be necessary to spray the trees soon after the flowering period.
15. Bacterial wilt of tomatoes was prevalent on the Experiment Station, Gangaruwa. An attempt to sterilize the seed by soaking for fifteen minutes in 0.1 per cent. mercuric chloride proved fatal to the seeds. Soaked seeds, germinated on blotting paper, showed only 2 per cent. germination, and those planted after soaking showed only 26 per cent., while the controls yielded 72 and 68 per cent. respectively.
16. Preliminary investigations into the diseases of the castor-oil plant have shown the existence of two leaf diseases, *Melampsorella ricini* (Biv. Bern.) Pass, and *Cercosporina ricinella* (Sacc. & Berl.) Speg., two stem diseases, a root disease, and a fruit rot.
17. Other diseases recorded for the first time include *Erysiphe polygoni* (DC.) on Peas, a stem canker (Nectria) of *Acacia decurrens*, *Phragmidium disciflorum* (Tode) James on Rose, Downy Mildew, *Plasmopara viticola* (Berl. et de Toni) on Grape vine, *Cladosporium* on Sorghum.
18. "Dry rot" in mud and wattle walls of up-country bungalows has been found to be caused by a species of *Merulius* in several cases. The fungus is brought in from the jungle in unsound poles, and in some cases it may be found growing over the surface of the wall before the "mudding" is completed.
19. Specimens of fungi, to the number of about 500, for the mycological herbarium have been received in exchange from the Bureau of Science, Manila, Professor C. F. Baker, and Professor H. Sydow. Specimens have been sent to these contributors, and to the American Department of Agriculture, the Rev. F. Theissen, Messrs. C. G. Lloyd, A. D. Cotton, and Professor J. C. Arthur.

WEEDS.

20. As a general belief prevailed that weeds were introduced with manures, an investigation was carried out on this point. The results of this have been published in the *Planting Gazette*. Samples of weeds from estates in different districts were obtained, but no new weeds were discovered. In general, it may be said that the specimens show that the well-known up-country weeds are spreading down.
21. Some experiments have been conducted with *Oxalis*. A solution of copper sulphate, 5 per cent., kills the foliage, as well as that of *Ageratum*, *Cestrum*, *Galinsoga*, &c. Spraying with liquid fuel kills the entire plant, the liquid soaking down the leaf stalks into the bulb, but it does not affect the bulbs which may be lying dormant in the soil. Liquid fuel killed practically everything showing above ground, including vigorous plants of castor, *Rubus ellipticus*, *Jasminum sambac*, *Asclepias curassavica*. Neither of these methods could be used among permanent crops, but liquid fuel might be employed to kill the bulbs after collection. It has been found that there are two species of *Oxalis* included under the general term on Ceylon estates. *Oxalis violacea* is the less common species. What is usually known as Manickwattee weed is *Oxalis corymbosa*. *O. violacea* is the predominant species at Hakgala. *O. corymbosa* is widely spread through the eastern tropics, and appears to be a common weed of civilization.
22. A quantity of the Water Hyacinth was found in a well near Wattegama in June last. It was collected and destroyed.

LABORATORY.

23. Visitors to the Laboratory included Dr. Oscar John (St. Petersburg), M. Schæffer (Paris), Professor Dr. Zettnow (Berlin), Gentaro Yamada (Japan), Dr. Vriens (Medan), Dr. Phil. Josef Doposcheg Uhlar (Munich), Dr. M. W. Senstius (Java), Dr. G. Sweet (Melbourne), Dr. V. F. Kope (Tananarive), W. McRae (Madras), Professor K. Keilhack (Berlin), Dr. W. F. Bruck (Giessen), Professor Ono (Japan), Professor Sukeya Fujita (Japan), Professor Dr. Ludwig Plate (Jena), W. J. Gallagher (Singapore), O. T. Faulkner (Malaya), W. P. Thompson (Harvard), F. A. Potts (Cambridge).
24. The following papers and articles have been published during the eighteen months :—
 - A.—*In the Annals of the Royal Botanic Gardens, Peradeniya* :—Ustilagineæ and Uredineæ of Ceylon; Revisions of Ceylon Fungi (Part III.); Termite Fungi: a Résumé; Papers and Records relating to Ceylon Mycology and Plant Pathology, 1783-1910; An Orchid new to Ceylon; White Ants and Fungi; The Black Termite of Ceylon; Notes on the Brazil Nut Tree in Ceylon.
 - B.—*In the Bulletins of the Department of Agriculture* :—Diseases and Pests Legislation in Ceylon.
 - C.—*In the Tropical Agriculturist* :—Pink Disease in Java; Fungoid Diseases of Cultivated Plants. Root Diseases of Hevea; Ceara Rubber; A New Disease of the Ceara Rubber Tree; Tropical Plant Fibres; The Introduction of *Hevea brasiliensis* into the East; A New Disease of Tea; Rubber Tree Diseases; Hevea Seed; The Introduction of Hevea into Perak; Tapping Experiments on Hevea; Tapping Experiments on Ceara; The Fundamental Principles of Rubber Tapping; The Nomenclature of Rubber Tapping; A Disease of Plantains; The Slope of the Tapping Cut; The Effect of Manuring on the Growth of Hevea; The Flower of the Coconut; The Water Hyacinth as a Fibre Plant; Pochote: a New Kapok Plant; The Rhinoceros Beetle; Tarring Pruning Cuts on Tea.
 - D.—*In the Planting Gazette* :—Rubber Tree Diseases; Sterilization of Manures.

HERBARIUM.

25. Four hundred and eighty specimens have been sent in for identification. These consisted chiefly of weeds submitted by planters, and a collection of plants made by Dr. K. Keilhack, who has been investigating the Flora of peat mosses in Ceylon. In addition to the above, a large number of specimens have been identified for members of the staff and in the course of re-labelling the Gardens.

26. The valuable collection of Ceylon grasses made by Mr. J. F. Jowitt, late of Craig, Bandarawela, and presented by him to the Agricultural Society, has now been deposited, with his sanction, in the Herbarium. The mounted series of Ceylon cereals, which was presented to the Gardens by him some years ago and unfortunately mislaid, has been discovered, and is now on exhibition in the Museum. Other acquisitions include the first century of "*Flora Hungarica exsiccata*," kindly presented by the Botanical section of the Hungarian National Museum. It is hoped to carry on a more extensive exchange in future, more especially with reference to the common plants which are likely to occur as weeds in Ceylon.

27. It is proposed to add to the herbarium a collection of seeds of Ceylon plants, to facilitate the identification of the various samples of seeds which are submitted from time to time.

28. Specimens of economic plants grown on the Experiment Stations have been added to the herbarium when possible. The importance of this side of the herbarium work was fully appreciated thirty years ago, but it has since been allowed to lapse. To an Agricultural Department one of the chief uses of a herbarium lies in the fact that it provides an indisputable record of the plants experimented with. It may happen that seeds or plants are imported whose cultivation proves unprofitable and the species is allowed to die out. In such cases the accuracy of any advice, based on the experiments, as to the possibility of growing that particular plant with profit depends upon the authenticity of the seeds or plants tried. Now, it is a matter of common knowledge that plants and seeds are only too frequently sent out under the wrong name, and hence there is always an element of doubt, unless a herbarium specimen is available for consultation. It may be thought that this state of affairs is somewhat imaginary as regards species, though experience shows it is quite common. But the need of herbarium specimens is still more urgent when varieties are considered, for the profitable cultivation of a product frequently depends upon the selection of the right variety. In such a case as that as the Soy bean, the varieties of which differ so remarkably in habit and value, it is especially necessary to preserve specimens of all varieties tried. It is hoped to place in the herbarium specimens of all species cultivated by the various branches of the Department.

29. Specimens for scientific investigation have been supplied, or loaned, to Messrs. Burroughes, Wellcome & Co., London; M. Colani, Paris; Professor H. Winkler, Hamburg; Mr. S. T. Dunn, Kew. Consignments of *Hedychium flavescens* and *H. coronarium* were collected by the Herbarium staff for transmission *via* Kew to Africa.

LIBRARY.

30. The collection of pamphlets left by Mr. Green has been indexed, as well as a large number previously classified as miscellaneous. Including recent acquisitions, this has entailed the addition of 2,760 cards to the card catalogue. A considerable amount of indexing still remains to be done, more especially in connection with files of bulletins which have hitherto been included under a single P. P. entry.

31. The plan of keeping recent numbers of periodicals in special pigeonholes, as in the South Kensington Science Library, has been adopted. This method demands less space than any other, and is the only one practicable where a large number of periodicals has to be dealt with.

32. Periodical publications issued as separate bulletins are now filed in series, the practice found most convenient in large libraries.

33. Four new sets of shelves have been put up. The progress of this work must now be suspended until some other room is available for meetings.

T. PETCH,
Botanist and Mycologist.

REPORT OF THE ENTOMOLOGIST.

MR. A. RUTHERFORD, the Government Entomologist, assumed duties on April 7, 1913. Much of his time has been taken up in overhauling the collections, and this work is still in progress. In a hot, moist climate like that of Ceylon the keeping of insects is a difficult task. It is rendered more so by the fact that the collections of an Economic Entomologist cannot be shut up during the hot, moist weather: as they are constantly required for reference. The preceding remarks refer specially to the cabinet material, but the alcoholic material demands almost as much attention. The alcohol evaporates readily, and, owing to the fact that the material is being constantly required for reference, means of rendering the tubes airtight are inexpedient.

2. Many of the insects sent in for report have to be carried through their various stages before an identification can be made. They must also be kept under regular observation, for there is no saying what fact will emerge—*e.g.*, presence of parasites. Records have to be kept of all observations. No one who has not had experience of such work is able fully to appreciate the amount of time that it requires.

3. The laboratory was found to be very poor in slide preparations of Coccidæ, Aleyrodidæ, Thripidæ, and Hymenopterous parasites, and many slides of these insects have been made in the course

of the year. Extensive collections of named insects are not only a valuable adjunct of an Economic Entomologist's Office, but they are practically indispensable.

4. The collections have been added to in other groups of insects, and I desire to thank the under-mentioned gentlemen for help willingly given in the work of identification:—Guy A. K. Marshall, Director, Imperial Bureau of Entomology, London; Dr. L. O. Howard, Chief, Bureau of Entomology, Washington, D. C.; Mr. N. Annandale, Superintendent of Indian Museum, Calcutta.

PESTS OF TEA.

5. *Xyleborus fornicatus* Eich. (Shot-hole Borer of Tea) has received a considerable amount of attention in the course of the year. It has been found that its proclamation under the Plant Pests Ordinance of 1907, from which much was hoped, has been ineffective. The Planters' Association has declared that the proclamation of this pest on individual estates is desirable, and a draft of suggested legislation to prevent the further spread of the insect has been prepared by the Entomologist.

6. The Committee of Agricultural Experiments and the Planters' Association have shown themselves to be strongly in favour of an Entomologist being temporarily appointed to devote his attention exclusively to a study of this pest with a view to discovering a method of control.

7. Meanwhile I am convinced that the *burying* of prunings, as a means of control, is almost useless, and I hope at an early date to publish the details of the experiments on which this conclusion is based.

8. I am of opinion that *burning* of the prunings is the only effective means of control that can at present be recommended.

9. The burying of prunings has furthermore certain disadvantages owing to the concentration of so much decaying organic matter in proximity to the roots of the plants. One correspondent, complaining of cockchafer injury, informed me that the larvæ were present in all of the holes containing prunings.

10. Inquiries regarding Shot-hole Borer have been received in the course of the year from Matale, Badulla, Ingiriya, Madulkele, Experiment Station at Peradeniya, Rattota.

11. An insect was sent in in October from Wattedgama in the belief that it was a Shot-hole Borer. It was attacking plants in the nursery, the point of attack being below the ground level. It was identified by Col. Winn Sampson as *Xyleborus compactus* Eich. It is much smaller than *X. fornicatus*, and the insects present in each gallery are much more numerous. The same insect also occurs in twigs of coffee in Ceylon. A watch should be kept for it, and the plants and twigs attacked should be destroyed.

12. There have been numerous inquiries regarding *Zeuzera coffeæ*, Nietn. (Red Borer or Coffee Borer). A short note on this insect appeared in the December number of the "Tropical Agriculturist." It seems to be widespread throughout the tea districts of Ceylon, and is often mistaken for Shot-hole Borer. Whenever found it should be destroyed by cutting out, by prodding with a sharp wire, or by the use of carbon bisulphide. It occurs in many other plants besides tea, and has long been recognized as a persistent pest.

13. Another borer that has been more prominent than usual, judging from the records in the office, is what is known as The Bark-eating Borer. It feeds on the bark, and lives in a short gallery in the stem. Its feeding ground is always covered with a canopy of frass bound together with silk. This caterpillar does not do much harm directly, but it provides a possible means of access of white ants to the tissues. Doubtless also the gallery forms a centre of decay. This borer should be dealt with as recommended for Red Borer.

14. The common nettle-grubs have all been reported—*Natada nararia*, Moore (The Fringed Nettle-grub), *Thosea recta*, Hamps. (The "Morawak Korale" Nettle-grub), *Parasa lepida*, Cram. (The Blue-striped Nettle-grub). *Natada nararia* was reported from Badulla and Demodera. In the latter case 80 acres were said to be affected, and all the leaves dropping off the bushes. *Thosea recta* and *Parasa lepida* were reported from Ratnapura. The former at the time of inquiry had consumed some 10 acres of tea. *Heterusia cingala*, Moore (Red Slug), has been reported twice: once, in August, from Badulla, and again, in December, from Galaha.

15. The practice usually followed in dealing with these leaf-eating caterpillars is to collect them by hand, or to prune the bushes and burn the prunings.

16. Red Slug may quite well be collected by hand, but not so the nettle-grubs, as they are provided with urticating hairs. When the tea is near pruning time, pruning and burning is to be recommended. But when the tea is still some considerable time from pruning, this method is too drastic, and resort should be had to spraying with arsenate of lead. Were two or three pluckings discarded thereafter, there would be no danger of arsenate of lead getting into the made tea.

17. Arsenate of lead should be kept in stock ready for use. Numerous occasions arise when it might be used with good effect, as in the case of caterpillars defoliating dadap, croton, albizzia, &c.

18. Mites have been common, especially *Tarsonymus translucens*, Gr. (Yellow mite). An article on mites and their control appeared in the December number of the "Tropical Agriculturist."

19. Information has been sought on several occasions regarding termite injury to tea bushes. Nothing can be done except to destroy the nests whenever they are located. The most convenient substance for this purpose is carbon bisulphide. An article giving directions for its use appeared in the "Tropical Agriculturist" for December.

20. Various experiments have been carried out with alleged white-ant remedies. After a fair trial of Mr. Bandara Beddewela's mixture the conclusion has been reached that no good is done by it over and above that done by the mere digging out of the nest. Dynamite exploded in ant-hills was found to have left the termites unharmed.

21. Blocks of wood impregnated with "Cordirol" were subjected to the test of exposure to white ants at the request of a Hamburg firm. After three weeks or so all three blocks were found to be badly eaten.

22. Other insects reported from tea in the course of the year are Bagworm, *Helopeltis antonii*, Sign., *Stauropus alternus*, Wlk. (Lobster Caterpillar), Tortrix, *Lecanium formicarum*, Gr., *Orygia postica*, Wlk., *Taragama dorsalis*, Wlk. In the case of *Taragama dorsalis*, the caterpillars had been feeding on dadap. The Tortrix was said to be confined to acacia-planted fields.

PESTS OF RUBBER.

23. Specimens of a Cerambycid beetle, *Mæchotypa verrucicollis*, Gahan., were received in August from the Kandy District with the information that they were eating the bark of rubber stumps planted the previous month. In the office we have records of the same kind of damage done by the same insect from Matale and Ukuwela. The last report was received in 1907. It has been determined by experiment that the beetle will attack healthy bark with impunity, but that it prefers dry bark. The beetles are large and sluggish, and could be easily collected. Were they present in large numbers the bark might be sprayed with arsenate of lead at a strength of 5 lb. to 100 gallons of water.

24. No complaint of Root Borer, *Batocera rubra*, L., has been received. A larva, however, that I am not able to separate from that of *Batocera rubra* was sent in as a cockchafer grub. It had been taken in the soil of a tea plantation at Galaha.

25. On several occasions *Saissetia nigra*, Nietn. (Black Scale), has been sent in. This scale should be regarded as a potential enemy and destroyed whenever found. It occurs on many species of plants. On rubber it is to be found on the leaves and young twigs, and is usually attended by numbers of the large red ant.

26. A block of Wickham-smoke-cured rubber (imperfectly cured) infested on the outside by maggots was submitted for report. The rubber had begun to decompose, and the maggots, which were those of a species of Phorid, were feeding on the products of decomposition. Insects of this group are usually scavengers.

PESTS OF CACAO.

27. An attack of Bark-eating Borer at the Experiment Station was investigated, and the use of a wire-probe or carbon bisulphide recommended.

28. *Cyclopelta siccifolia*, Westw., was found feeding in two large colonies on a branch of cacao. No eggs or nymphs were present. The favourite food plant of this bug is dadap.

29. *Helopeltis antonii*, Sign., was reported from Gampola in September. The correspondent thought he had discovered a new disease! Spraying the pods with kerosine emulsion, preferably when the bugs are young, is recommended.

PESTS OF COCONUT.

30. Material was sent in in March from Wennappuwa. The lower epidermis of the leaves was eaten, and only the maturer leaves were said to be attacked. The dead pupa of a Micro-lepidopteron was present in a cocoon of frass lined with white silk. It was probably *Nephantis serinopa*, Meyr. (The Black-headed Coconut Caterpillar).

31. *Rhynchophorus ferrugineus*, F. (Red Weevil), was reported as doing much damage in one plantation in Panadure in June. On the advice of the Entomologist a tree at the Experiment Station was treated with carbon bisulphide introduced into auger holes. All the grubs were reported to have been killed.

32. The caterpillars of a Hesperid were received in August from Tangalla with the report that they were attacking in large numbers coconuts planted in the preceding June. The use of an arsenical, preferably lead arsenate, was recommended.

PESTS OF RICE.

33. Only one complaint of injury by insects to rice was received. It was from Matara in April. The insects were the caterpillars of two species of Hesperid (probably *Parnara colaca*, Mo., and *Parnara mathias*, Fabr.). In the box in which they were sent were several Dipterous puparia, from which Tachinids emerged. These had in all probability been parasitic on the caterpillars.

34. Against such *gadavellu*, a name given in Ceylon to any insect larva that attacks paddy, arsenate of lead at a strength of 4 lb. to 100 gallons of water should be applied. Paris green seems to be much more easily obtainable in Ceylon than arsenate of lead. As compared with the latter, Paris green has the disadvantage of being liable to "burn" the foliage. If applied as a spray, it should be used at a strength of $\frac{1}{4}$ lb. to 50 gallons of water, and $\frac{1}{4}$ lb. of freshly-slaked lime should be added. Arsenate of lead can be obtained from Messrs. Waldie & Co., Konnagar, Calcutta, at Re. 1 per lb.

PESTS OF COTTON.

35. *Saissetia nigra*, Nietn. (Black Scale), was sent in in June with the report that the insect had attacked most of the plants at Hettipola and Balalla Experiment Gardens. This is the Black Scale of cotton of the West Indies. There at the present time it is kept in check by a Hymenopterous parasite, *Zalophothrix mirum*, Craw. Spraying the plants with kerosine emulsion, preferably at the time when the larvæ of the scale are crawling about prior to settling down, is recommended.

36. *Oxycaenus lætus*, Kby., a small Lygæid, was received from Ambalantota in July with the report that the cotton was full of them, and that they did not appear to leave the cotton even when exposed to the sun.

PESTS OF CITRUS.

37. In October a small beetle, *Apogonia comosa*, Kav., was reported to be attacking the leaves of citrus at Bandaragama. A mite, closely resembling if not identical with *Tetranychus mytilaspidis*, Riley, a serious pest of citrus in California, has been found injurious to the foliage of citrus at Peradeniya.

MISCELLANEOUS PESTS, &c., REGARDING WHICH INFORMATION AND ADVICE HAVE BEEN SOUGHT.

38. Nootuid caterpillar, destructive to foliage of lily; various Scolytidæ in stem of tea attacked by root rot; Aphid (probably *Aphis gossypii*, Glov.), infesting cucumber near Peradeniya; *Tachardia lacca*, Kerr (this lac was from Indian Kosun brood-lac put on *Zizyphus jujuba* on an estate near Kandy on February 25, 1913. From material brought in to the laboratory numerous parasites emerged: the moth *Eublemma amabilis*, Mo., several specimens of a species of Braconid, and several species of Chalcids. The Braconids are probably parasites of the Eublemma, and the Chalcids may be primary parasites of the Tachardia, or secondary parasites of the Braconid. From material cut from the tree on July 14 the larvæ of the Tachardia commenced to emerge on August 14. This fact has an important bearing on the

shipment of material from one place to another); Lepidopterous larva, probably that of *Phycita leuconurella*, in fruit of cashew; fruit-fly (*Dacus cucurbitæ*, Coq.) and a Chrysomelid (*Aulacophora*, sp.) doing injury to snake-gourd; "gumming" of *Acacia decurrens*; Weevils (*Odoiporus longicollis*, Oliv.) in rhizomes of plantain from Colombo (the plantains were primarily suffering from disease); *Agromyza phaseoli*, Coq., a Dipteron attacking beans at the Experiment Station; a Drosophilid breeding in jam; *Terastia meticulosalis*, Guen., the larva of which tunnels in twigs of dadap and red toona; Dipteron (probably *Agromyza phaseoli*, Coq.) attacking gram at the Experiment Station, Peradeniya; *Dorylus orientalis*, Westw., an ant attacking Kohl-Rabi at the Experiment Station; Mango weevil (*Cryptorhynchus mangiferæ*, Fabr.) from Jaffna; Noctuid caterpillar damaging brinjal at Galboda; Scolytidæ in Ceara at the Experiment Station, following "bark rot"; Leaf-miner of camphor from Burma; wax attacked by caterpillar of wax moth; "Muga worm" (*Antheræa assama*); *Saissetia nigra*, Nietn., and *Pulvinaria*, sp. (probably *Burkilli*, Gr.) on *Croton Tiglium* at Kadugannawa; flea beetle destroying ferns at Lindula; Aleotheid on cassava from Seychelles; Scolytidæ in Hevea from Uganda; *Hæmatopota*, sp. on cattle at Hambantota; *Chrysops dispar*, F., on cattle at Hambantota; large weevil (*Sipalus hypocrita*, Boh.) in rubber attacked by canker; *Stomoxys calcitrans*, Linn., from Talawakele; Maggots (*Musca domestica*, L.) in (fish?) manure from Talawakele; *Orgyia postica*, Wlk., whose caterpillars were defoliating dadap; *Icerya*, sp. and *Lepidosaphes gloveri*, Pack., on variegated croton; African snail (*Achatina fulica*) from Kandy District; *Taragama dorsalis*, Wlk., defoliating dadap; *Aularches miliaris*, Fabr. (Spotted Locust), feeding on *Elucine coracana* at the Experiment Station, Peradeniya; Caterpillar (as yet undetermined) of a Lasiocampid defoliating dadap at Kandy; Noctuid caterpillar, probably that of *Amyra selenampha*, Guen., defoliating *Croton Tiglium* at Matale; eggs of a locustid in a twig of cacao; *Xyleborus*, sp. (indistinguishable from *X. compactus*) in twig of custard apple; Dipteron larvæ in decaying plantain stem from Experiment Station, Peradeniya; saw-fly defoliating *Dioscorea pentaphylla* at Peradeniya; Microlepidopteron rolling and eating leaves of cotton; Microlepidopteron defoliating lucerne at the Experiment Station, Peradeniya; Noctuid larva destructive to vegetables at Galle; *Euproctis scintillans*, Wlk., Noctuid larvæ and Tortrix defoliating *Acacia decurrens* at Rozelle; *Tachardia albizziae*, Gr., and *Pulvinaria*, sp. on *Nephelium Litchi*; *Popillia disealis*, Walk., a beetle, defoliating roses at Kandapola; *Coccus viridis*, Gr., on coffee at Experiment Station, Peradeniya.

39. The following insects, &c., among others have not been reported, but have come under the observation of the Entomologist:—Lepidopterous leaf-miner of Citrus; ragged holes in tea leaves due to their having been pierced by the falling petioles of dadap (these holes were for a time a puzzle); Lycænid larva feeding on flowers of tea; various species of Thrips on tea; nymphs of a Membracid feeding on young shoots of tea; Lycænid larva feeding in fronds of Cycas at Peradeniya; *Ceylonica theæcola*, Buck., on tea, cacao, citrus, and *Ixora coccinea*; various ticks on cattle and goats; *Oscinis theæ*, Bigot, Tea Leaf-miner. (This insect has been found to be freely parasitized by several species of Chalcids. The same, or a very nearly allied insect, mines in the leaves of *Tylophora asthmatica*, *Gloriosa superba*, *Oxystelma esculentum*, and *Momordica charantia*; these plants are frequently to be found growing up through the tea); *Heortia vitessoides*, Moore, defoliating plants of *Lagetta lintearia* at Peradeniya; Chrysomelid beetle defoliating *Murraya Kœnigii* at Peradeniya; *Coccus viridis*, Gr., on *Funtumia elastica*, the larva of a Pyralid (*Cryptoblabes proleucella*, Hmp.) was feeding on the scales; what seems to be the same caterpillar feeds on the Bamboo aphid, *Oregma bambusæ*, Buck; Noctuid caterpillar (probably *Hypocala deflorata*, Fabr.) defoliating *Diospyros montana* at Peradeniya; *Caprinia conchylalis*, Guen., defoliating *Funtumia elastica*; *Arctia ricini*, Fabr., defoliating beans; *Pseudococcus*, sp. on indigo; *Xyleborus*, sp. (which I am unable to separate from *X. fornicatus*), in twigs of Avocado Pear, causing them to fall over and wither; *Coccus viridis*, Gr., and *Ischnaspis longirostris*, Sign., on *Landolphia Kirkii* at Peradeniya; a species of Thrips, near, if not, *Cryptothrips*, sp., damaging buds of camphor at Peradeniya Gardens and at Experiment Station, Peradeniya.

40. I have attended all the meetings of the Committee of Agricultural Experiments, and have attended two meetings of the Board of Agriculture at Colombo. In April I paid a visit to the Kelani Valley in order that I might get an idea of Shot-hole Borer conditions there.

41. Mr. L. B. Caspersz, Field and Laboratory Assistant, who assumed duty on October 13, has been fully employed attending to the collections and learning the rudiments of Entomology.

A. RUTHERFORD,
Government Entomologist.

January 3, 1914.

REPORT OF THE GOVERNMENT CHEMIST.

On March 6, 1913, I left Ceylon on six months' leave, and during my absence Mr. A. Bruce acted as Government Chemist, and attended the meetings of the Committee of Agricultural Experiments at Peradeniya and Chilaw.

2. On arrival in England I was asked to serve on several Committees, and attended numerous meetings. These included meetings of the Tropical Agricultural College Committee, and a visit to the Royal Agricultural College, Cirencester, to discuss points with the Principal, Professor Aynsworth Davis; the Third International Congress of Tropical Agriculture at the Imperial Institute; a Committee of the Northern Polytechnic Institute to arrange a scheme for special classes for instructing rubber factory employes in the theory and practice of rubber vulcanization and the manufacture of rubber goods.

3. Rubber factories were visited to inquire into the use of plantation rubber, and to discuss the form in which manufacturers preferred it. The general conclusion was that crepe, pale or dark, smoked sheet, and other forms were required, but that uniformity of type was essential.

4. I also attended at the Imperial Institute to arrange for the appointment of the Rubber Chemist, and to discuss the working scheme with Professor Dunstan.

5. A scheme was also drafted and submitted to the Rubber Growers' Association for the standardization of rubber, and I was appointed on the Standardization Committee.

6. Woburn Experiment Station was also visited with Dr. J. A. Vœlcker to note the effect of various chemicals on plant development. The effect of a varying ratio of lime to magnesia was most pronounced, not only on the growth of the crop, but on the character of the grain; the latter, though from a Cambridge selected strain, being completely modified by varying the proportion of lime to magnesia.

7. The effect on root growth was also very pronounced, excess of magnesia producing a very fibrous root development. The effect of nitrolim as compared with ammonia salts and nitrates was also noted, and the results correspond with the experience of its use in Ceylon.

8. I returned to Ceylon on September 6 and resumed duties on that date.

9. During 1912 and 1913 several visits were made to the various parts of the North-Central and Eastern Provinces to examine the soil and conditions for the growth of various products in those districts.

10. The large block of about 7,000 acres of irrigable land below the Nachchaduwa tank was investigated as to its suitability for the growth of coconuts and paddy, and the irrigable portions of the soil are excellent for the purpose. About 3,000 acres run below a special irrigation channel reserved for coconut cultivation, and 4,000 acres to the south can be irrigated from another channel from a higher level on the tank. When opened, this large area with some 8,000 acres of tanks in the neighbourhood would tend to maintain a moist atmosphere during the dry months of the year, and favour the growth of the palms.

11. Other blocks of irrigable land were also examined, and they would all grow paddy, and for the most part coconuts as well, and it is hoped that these areas will be opened up and colonized in the near future.

12. Much of the irrigable land in the Northern Province is suitable for the castor oil plant, which grows freely on old chenas and waste land, and it is suggested to try and induce the cultivators of these districts to grow this plant in their chenas as a mixed crop, collecting the seed after the kurakkan or other crop has been harvested. Over 21,000 tons of castor, ground nut, and rape cake are imported annually for manurial purposes, valued at over Rs. 1,793,000, most of which could in time be replaced by home-grown seed. Experiments are being conducted on the yield of oil from different varieties to ascertain the price that could be paid to the cultivators for the seed.

13. The question of the manufacture of charcoal, acetic acid, alcohol, creosote, and tar from the otherwise useless timber trees in the forests of the North-Central Province was also investigated, and estimates have been obtained for the erection of a trial plant in a selected area. Large quantities of acetic acid are imported for rubber manufacture, and the crude distillates can be utilized for preserving and smoking rubber without purification. With the introduction of suction gas plants a new market for charcoal has arisen, which would absorb considerable quantities. The production of a cheap, pure charcoal would possibly permit of the revival of native steel manufacture, utilizing pig iron instead of ore.

14. Several visits were made to the Maha Iluppallama and Anuradhapura Experiment Stations, and to select coconut experimental areas in Chilaw, Negombo, Kurunegala, and other districts.

15. The analytical work conducted in the laboratory in Colombo included :—

Analysis of tea, rubber, sugar, and coconut soils, also soils from the experiment stations under various products.

Complete analysis of tea prunings for the Gangarooowa experimental plots to determine the amount of mineral and nitrogenous matter removed per acre.

Complete analysis of palmyra fruit paste and husk.

Analysis of suriya branches used as green manures for tobacco in Jaffna District and the *Pithecolobium saman*.

Analysis of rubber of different varieties, rubber seed, husk, and meal.

Complete analysis of *Hevea latex*.

Analyses of the manure mixtures employed for the coconut experimental plots at Chilaw.

16. A considerable amount of correspondence regarding agricultural questions has been attended to, and many visitors interested in tropical agriculture have been shown round the Experiment Station or taken to various estates in different parts of Ceylon.

17. The question of green manuring for tea, rubber, and other products is being continually urged on planters, and the results of such green manuring have been highly satisfactory in promoting the permanent improvement of the various products.

M. KELWAY BAMBER,
Government Chemist.

REPORT OF THE SUPERINTENDENT OF BOTANIC GARDENS.

CHANGES IN THE STAFF.

WITH the re-organization of the Botanic Gardens, now a division under the Department of Agriculture, the following changes in the staff took place. The writer, formerly Curator of the Royal Botanic Gardens, Peradeniya, has been appointed to the post of Superintendent of the Division of Botanic Gardens, comprising Peradeniya, Hakgala, Nuwara Eliya, Henaratgoda, as well as the Governor's Gardens at Colombo, Kandy, and Nuwara Eliya. The post of Curator at Peradeniya has been filled by Mr. T. H. Parsons, who arrived from Kew in January, 1914. I have been absent on leave from July 17, 1912, to June 23, 1913, my duties being shared during my absence by Messrs. T. Petch, the Mycologist, and J. J. Nock, Curator of Hakgala Gardens.

2. The Foreman at Peradeniya, Mr. K. J. Alexander, has been transferred to Hakgala Gardens, the Foreman of the latter (Mr. D. T. de Alwis) taking the former's place at Peradeniya. Mr. G. E. Punchibanda, first upper-gardener, has been promoted to the new post of nurseryman, and this permitted of other promotions in the rank of upper-gardeners, Mr. W. P. Jasinghe being appointed to the vacancy thus caused at the bottom. The post of clerk to the Curator has been filled by the appointment of Mr. A. S. Munisinghe.

ROYAL BOTANIC GARDENS, PERADENIYA.

FRONTAGE BOUNDARY.

3. The high bank stretching from the Garden entrance to the river on the east side, which has marked the boundary here since the commencement of the Gardens, has been levelled down. This necessitated cutting down a number of trees, palms, and climbers which grew along the bank. The rough part of the work was done on contract, the final levelling, turfing, &c., being carried out by Garden labour. By this means an appreciable extension of space is secured for the spice collection, which was formerly very much cramped.

THE JUNGLE, OR WILD GARDEN.

4. The portion (section A on the Garden map) hitherto set aside in the arboretum to represent a jungle, where nature was left to herself unchecked and encouraged, has been cleared in my absence of all undergrowth, including ferns, shrubs, and climbers. It has not yet been decided what is to be done with this area, which occupies the extreme north end of the Gardens in a loop of the river.

FICUS ELASTICA GROVE.

5. The trees forming the magnificent grove of *Ficus elastica*, known as Rambong or Assam rubber, which had long formed a striking landmark near the entrance to the Gardens, have of late years been rapidly decaying and gradually crumbling away. This species was first introduced at Peradeniya about seventy-five years ago, and it is supposed the grove was planted about that time. Though of vigorous and rapid growth, attaining to an immense size, the tree is of comparatively short vitality. The trees in question had latterly become a source of danger owing to their proximity to the public road, and were consequently cut down and removed during the latter end of 1913, a heavy undertaking owing to the enormous ramifications of their buttressed roots.

RIVER SIDE.

6. The space between the river and the river drive has to be periodically cleared of superfluous growth, the fringe of large bamboos being isolated into clumps, thus rendering them more effective, while enhancing the views and vistas obtained through them and along the river. There is, however, a limit to the extent to which this work may be safely carried out, as owing to the periodical floods and loose sandy texture of the high banks, it is essential to retain a certain amount of vegetation of a binding nature in order to preserve the banks against erosion by the river.

OLD FERNERY OR ROCKERY.

7. By the recent extension and improvements to the larger fernery, which borders on the right of the main central drive, the old fernery or rockery by the stores has become superfluous. It was proposed to build in its place, which is well sheltered and shaded, a covered-in structure for the growth of water- and shade- loving plants, as *Nepenthes*, &c., but owing to the unsatisfactory state of the water supply this is at present impracticable. Meantime one-half has been cleared of beds, &c., for the purpose of utilizing the space for the growth of young palms and other plants in bamboos or pots requiring shade and shelter from wind.

ORCHID HOUSE.

8. The work of overhauling the orchid collection and rebuilding the plant-stages was commenced towards the end of 1913, and when completed will be a great improvement. It is hoped that before long a larger and more suitable structure will be built for this interesting and ever-popular class of plants.

NUTMEG GROVE.

9. This famous grove of nutmeg trees, now some seventy years old and still in their prime as regards fruit-bearing, has towards the end of 1913 received a heavy surface mulch of leaves, this being covered over with the earth taken from the old fernery close by, as above referred to. This should have a beneficial effect on the trees, whose roots were previously much exposed and lying closely matted on the surface.

LAGERSTRÆMIA AVENUE.

10. The avenue of the beautiful pink-flowered variety of *Lagerstræmia Flos-reginæ*, stretching from the main drive to the palmyra avenue, planted in 1909 to divide the floricultural section from the fruit-tree collection, was considered inappropriate, and most of the trees have been uprooted in my absence on leave. This is one of the most showy of flowering trees, and is known as "The Pride of India."

NURSERIES.

11. These have recently received special attention. The old nurseries by the canarium trees, having been found inadequate to our requirements, are henceforward to be confined to the propagation of plants of ornamental or botanical interest; while the propagation of economic kinds, as fruit, shade, timber, drugs, edible products, &c., will be carried on in the space hitherto known as the Experiment Plots, which will now be called the Economic Nursery.

NOTES ON ECONOMIC PLANTS.

EBONY (DIOSPYROS EBENUM).

12. The demand for this wood appears to be in excess of the supply. During the past year as much as Rs. 600 per ton has been paid locally for first class logs. There are several so-called ebonyes known on the market, but the Ceylon tree above referred to is the most valuable.

LIGNUM VITÆ (GUAIAECUM OFFICINALE).

13. This West Indian plant, which naturally forms a shrub or small tree, has been introduced at Peradeniya in 1882, but is of extremely slow growth, and the two specimens now in the collection are only about 6 feet in height. The species has not yet flowered here, but in the former Experiment Garden at Anuradhapura it flowered and fruited regularly, showing that it is best adapted to a semi-dry climate. This plant yields the *lignum vitæ* of commerce, a greenish, hard, and heavy wood extensively used by turners, also a fragrant resin commonly called "gum guaiacum," which is used medicinally.

OIL PALM (ELÆIS GUINEENSIS).

14. Inquiries have recently been made regarding this palm as a possible product for profitable cultivation, particularly in districts unsuited to the coconut palm. The tree is indigenous to the Gold Coast and other parts of West tropical Africa, and thrives at Peradeniya and in the low-country generally. It has been growing in the collections here since 1850, when it was first introduced, and specimens may not infrequently be seen growing in Ceylon as an ornamental palm in private gardens. Seeds ripened on our own palms have been sown, and in order to meet a possible demand more seeds are being ordered from its native home.

CARNAUBA WAX PALM (COPERNICIA CERIFERA).

15. The increase in demand for this vegetable wax, with the consequent increase in price, has caused inquiries to be made by planters regarding the possibilities of its production as a plantation product. The palm is suited to the low-country, but the prospect of its profitable cultivation in Ceylon is doubtful. The wax, which is specially suited to the manufacture of gramophonerecords, polishes, &c., is produced on the under side of the leaves, and is obtained either by drying the latter, when the wax peels off, or by cutting the leaves in sections and boiling them, when the wax rises to the surface and is then skimmed off.

NOTES OF BOTANICAL INTEREST.

BAIKEA INSIGNIS.

16. This leguminous tree, which was received from Kew as a young plant in 1902, has flowered here in 1913 for the first time. The flowers are remarkable for their large size.

ELÆOCARPUS GANITRAS.

17. An Indian tree introduced here some forty years ago has fruited profusely during the latter end of 1913. The round fruits when covered with their bright deep-blue epicarp present a pretty and striking appearance.

TALIPOT PALM (CORYPHA UMBRACULIFERA).

18. A remarkably fine specimen of this noble palm—the giant of the palm tribe—commenced to flower in the Gardens, behind the nurseries, early in July, 1913, the inflorescence reaching full development by the end of the year. The palm is about 110 feet in height, and estimated to be approximately sixty years old. This species only flowers once, the enormous panicle of inflorescence, which in the present case is 26 feet in height above the leaves, being followed a year later by the ripe fruit, resulting about ten months thereafter in the death of the tree.

KOKIA ROCKII.

19. Seeds of this beautiful Malvaceous tree of Hawaii, where it has become almost extinct, have been received from the United States Department of Agriculture, and four plants have been successfully raised. Mr. Rock, who discovered the tree, and in whose honour it is named, informed the writer that there are only three growing specimens of it in existence, and it is seed obtained from these that we have received with a view to preserving the species.

PENTADESMA BUTYRACEA

20. This West African tree, which was received as a small plant from the Royal Botanic Gardens, Kew, in 1897, fruited during 1913 for the first time here. The tree grows to a large size, and yields from the bark as well as from the large brown fruits, a yellow greasy substance; hence the tree is known in its native country as the "Butter" or "Tallow-tree."

PESTS.

(HYDRILLA OVALIFOLIA.)

21. The water-weed in the lake has continued to exert its vigorous growth, repeatedly occupying all space almost to the total exclusion of other plants; therefore persistent warfare has to be waged against it in order to keep the pest in check. This is the notorious water-weed which used to involve the Colombo Municipality in vast sums of money in trying to keep it in check in the Colombo lake before the work of filling in the latter was begun.

SENSITIVE PLANT (MIMOSA PUDICA).

22. Much has been done during the past year in reducing the areas occupied by this undesirable weed, more especially in the arboretum. I have always found that persistent cutting down, where practicable, is preferable to digging out the plants. Thus the Peradeniya golf links, which a year ago were almost covered with the pest, are now almost free of it.

TERMITES OR WHITE ANTS.

23. The suppression of these and their castellated nests, which disfigure the lawns, especially in the wet season, requires constant attention and considerable expenditure in labour. A method of destroying them by means of a mixture claimed to be discovered by Mr. K. B. Beddewela of Maligatenna, Kandy, has not proved a success, while exploding the nests by dynamite charges has also proved a failure. Therefore recourse has still to be had to the more laborious but thorough method of digging out the nests and destroying the queen-ant.

FLYING FOXES (PTEROPUS EDWARDSII).

24. These have multiplied recently to an enormous extent, and measures have now to be adopted to keep them in check by shooting. They have lately developed a partiality for the fine row of the Java almond trees (*Canarium commune*) by the nurseries, and completely defoliated a large portion of these from the top.

OFFICE.

25. The former offices of the Curator and staff having been occupied by the Superintendent of Low-country Products and Secretary of the Ceylon Agricultural Society and staffs, the Superintendent of Botanic Gardens has been provided with an office at the Head office, which I have occupied since returning from leave in June.

26. Before going on leave in July, 1912, I acted as Secretary, and latterly as co-Secretary, of the All-Ceylon Exhibition held in Colombo in July, in addition to my official duties.

27. Since my return from leave I have paid several visits to Hakgala, Nuwara Eliya, Henaratgoda, Colombo, and Kandy Gardens; visited and furnished reports on laying out the grounds of the Nuwara Eliya hospital, the new residence for the Hon. the Colonial Secretary at Nuwara Eliya, and on the removal of a sacred Bo tree (*Ficus religiosa*) in Colombo. I have prepared an illustrated Bulletin on "The use of Explosives in Agriculture," published various illustrated articles in the "Tropical Agriculturist," prepared a list of selected trees suitable for Nuwara Eliya, &c. The letter register at my office shows the numbered correspondence to be: inward, 3,222; outward, 3,267.

VISITORS.

28. The number of visitors who have signed the Visitors' Book in 1912 is 4,497, and in 1913 4,839, which includes several European royalties. The approximate total number of visitors to the Gardens for 1912 and 1913, including local and foreign, is 82,056.

INTRODUCTIONS.

29. The following are the principal species introduced or re-introduced into the Royal Botanic Gardens, Peradeniya, during the period under review:—

Aberia caffra ..	..	..	(Botanic Gardens, Durban)
Acacia glauca ..	..	..	(Botanic Gardens, Lahore)
A. modesta ..	..	..	do.
Agave attenuata ..	..	..	(Royal Botanic Gardens, Kew)
A. atrovirens latissima ..	..	..	do.
A. Franzosini ..	..	..	do.
A. horrida var. ..	..	..	do.
A. Milleri var. variegata ..	..	..	do.
A. rigida ..	..	..	do.
A. rigida var. Ixtli ..	..	..	do.
A. schidigera ..	..	..	do.
A. Victoria-reginae ..	..	..	do.
Alocasia Mortfontanensis ..	..	..	(Russell's, Richmond)
A. sanderiana nobilis ..	..	..	do.
Aloe commutata ..	..	..	(Royal Botanic Gardens, Kew)
A. Eru ..	..	..	do.
A. mitriformis ..	..	..	do.
Areca Kentia ..	..	..	(Regnard, Mauritius)
A. sapida ..	..	..	do.
A. sp. (from Ramson Island) ..	..	..	do.
Aristolochia Kewensis ..	..	..	(Royal Botanic Gardens, Kew)
Aquilegia Helena ..	..	..	(Herb, Naples)
Artocarpus odoratissimus ..	..	..	(Department of Agriculture, Manila)
Asparagus myriocladus ..	..	..	(Vietch's, London)
Begonia Rex Beauty ..	..	..	(Russell's, London)
B. Rex Masterpiece ..	..	..	do.
Bougainvillea formosa ..	..	..	(Bull's, London)
Brownea Kewensis ..	..	..	(Royal Botanic Gardens, Kew)
Cæsalpinia Gillesii ..	..	..	(Dr. Stephens, Manila)
Caladium exquisite ..	..	..	(Russell's, Richmond)
C. Golden Queen ..	..	..	do.
C. Her Majesty ..	..	..	do.
C. Miss Elsie Hoffman ..	..	..	do.
C. Pintado ..	..	..	do.
C. President de la Deransuye ..	..	..	do.
C. Prince of Wales ..	..	..	do.
C. Rio de Janeiro ..	..	..	do.
Caladiums (a collection of 50 unnamed varieties) ..	..	..	(R. Hoffman, London)
Cassia beareana ..	..	..	(Secretary, Ceylon Agricultural Society)
Cattleya schroderæ ..	..	..	(Royal Botanic Gardens, Kew)
Cereus amecensis ..	..	..	do.

<i>Clavija ornata</i> ..	..	..	(Botanic Gardens, Trinidad)
<i>Clematis brachiata</i> ..	..	..	(Botanic Gardens, Durban)
<i>Clerodendron Bakeri</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>C. fragrans</i> var. fl. pl. ..	..	..	do. do.
<i>Cocos hybrida</i> ..	..	..	(Bull's, London)
<i>Croton sylvaticus</i> ..	..	..	(Botanic Gardens, Durban)
<i>C.</i> , six named varieties ..	..	..	(Veitch's, London)
<i>Curculigo recurvata variegata</i> ..	..	..	(Bull's, London)
<i>Cymbidium Lowianum</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>Cypripedium Boxalli</i> ..	..	..	(Agri-Horticultural Society, Rangoon)
<i>C. Exul</i> ..	..	..	do. do.
<i>C. Parishii</i> ..	..	..	do. do.
<i>Cyrtodeira fulgida</i> ..	..	..	(Bull's, London)
<i>Dendrobium nodatum</i> ..	..	..	(Agri-Horticultural Society, Rangoon)
<i>Dictyosperma aureum</i> ..	..	..	(Regnard, Mauritius)
<i>Dracæna atropurpurea</i> ..	..	..	(Veitch's, London)
<i>D. Doucettii Albertii</i> ..	..	..	do.
<i>D. Prince Manouk Bey</i> ..	..	..	do.
<i>Dyckia trigona</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>Epidendrum O' Brienianum</i> ..	..	..	do. do.
<i>Ficus glabrata</i> ..	..	..	(Department of Agriculture, Colombia)
<i>Furcraea Watsoniana</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>F. macrophylla</i> ..	..	..	do. do.
<i>Gasteria trigona</i> ..	..	..	do. do.
<i>Gloriosa virens</i> ..	..	..	(Botanic Gardens, Durban)
"Gnoyha de Chino"	..	..	(Corazza, Italy)
<i>Hæmanthus Katherinæ</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>Hexacentris lutea</i> ..	..	..	(Veitch's, London)
<i>Hibiscus aurora</i> ..	..	..	(Bull's, London)
<i>H. Rosea sinensis brilliantissimus</i> ..	..	..	(Veitch's, London)
<i>Ipomœa Thomsonii</i> ..	..	..	do.
<i>I. sidifolia</i> ..	..	..	(Department of Agriculture, Manila)
<i>Jacobinia chrysostephena</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>J. magnifica carnea</i> ..	..	..	do. do.
<i>J. magnifica velutina</i> ..	..	..	do. do.
<i>Java Cardamom</i> ..	..	..	(Van der Poorten, Kurunegala)
<i>Kokia Rockii</i> ..	..	..	(U. S. Department of Agriculture)
<i>Kraussia floribanda</i> ..	..	..	(Botanic Gardens, Durban)
<i>Lælia-cattleya Amanda</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>L. Pisandra</i> ..	..	..	do. do.
<i>L. purpurata</i> ..	..	..	do. do.
<i>Latania Loddigesii</i> ..	..	..	(Regnard, Mauritius)
<i>L. Verschaffeltii</i> ..	..	..	do.
<i>Leea macropus</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>Lettsonia modesta</i> ..	..	..	(Botanic Gardens, Durban)
<i>Mango "carabao"</i> ..	..	..	(Department of Agriculture, Manila)
<i>M. "pahutan"</i> ..	..	..	do. do.
<i>Maranta insignis</i> ..	..	..	(Russell's, Richmond)
<i>Marica northiana</i> ..	..	..	do.
<i>Marsdenia floribanda</i> ..	..	..	(Botanic Gardens, Durban)
<i>Nidularium princeps</i> ..	..	..	(Russell's, Richmond)
<i>N. Meyendorffii</i> ..	..	..	do.
<i>Opuntia crinifera</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>O. curassavica</i> ..	..	..	do. do.
<i>O. maxima</i> ..	..	..	do. do.
<i>Pandanus furcatus</i> ..	..	..	(Royal Botanic Gardens, Calcutta)
<i>Parkia timoriana</i> ..	..	..	(Bureau of Agriculture, Manila)
<i>Putranjiva Roxburghii</i> ..	..	..	(Botanic Gardens, Lahore)
<i>Pavetta obovata</i> ..	..	..	(Botanic Gardens, Durban)
<i>Pereskia aculeata</i> var. <i>Godseffiana</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>Philodendron andreanum</i> ..	..	..	do. do.
<i>P. Carderi</i> ..	..	..	(Bull's, London)
<i>Phoenix Roebeleni</i> ..	..	..	(Veitch's, London)
<i>Platyserium Hillii</i> ..	..	..	do.
<i>Plumbago coccinea superba</i> ..	..	..	(Russell's, Richmond)
<i>Polypodium Knightæ</i> ..	..	..	(Veitch's, London)
<i>Premna odorata</i> ..	..	..	(College of Agriculture, Philippines)
<i>Pseuderanthemum graciliflorum</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>Raphis australis</i> ..	..	..	(Bull's, London)
<i>Rollinia</i> sp. ..	..	..	(Regnard, Mauritius)
<i>Rubus lasiocarpus</i> ..	..	..	(Royal Botanic Gardens, Calcutta)
<i>Ruellia Baikiei</i> ..	..	..	(Royal Botanic Gardens, Kew)
<i>R. Portellæ</i> ..	..	..	do. do.
<i>Russelia Lemoinei grandiflora</i> ..	..	..	(Veitch's, London)
<i>Saccolabium Blumei</i> ..	..	..	(Agri-Horticultural Society, Rangoon)
<i>Sanchezia parvibracteata</i> ..	..	..	(Royal Botanic Gardens, Kew)
Seed—Breadfruit ..	..	..	(Ceylon Agricultural Society)
<i>Spondias cytherea</i> ..	..	..	(Botanic Station, Seychelles)
<i>Terminalia arjuna</i> ..	..	..	(Botanic Gardens, Lahore)
<i>T. tomentosa</i> ..	..	..	do. do.
<i>Tradescantia decora</i> ..	..	..	(Russell's, Richmond)
<i>T. tricolor</i> ..	..	..	do.
"Tugue Yam" ..	..	..	(Forest Department, Manila)
<i>Turraea obtusifolia</i> ..	..	..	(Botanic Gardens, Durban)
<i>Zanthoxylum Thunbergii</i> ..	..	..	do. do.
<i>Zizyphus trinervis</i> ..	..	..	(Bureau of Agriculture, Manila)

INTERCHANGE OF PLANTS AND SEEDS.

30. Plants and seeds have been received from the following :—Royal Botanic Gardens, Kew; the Botanic Gardens of Durban, Rio de Janeiro, Sydney, Calcutta, Saigon, and Seychelles; the Agri-Horticultural Gardens of Madras, Lahore, Kandawglay, and Lucknow; the Departments of Agriculture, Washington, Trinidad, Bogota, and Manila; the Bureau of Forestry, Manila; the Conservator of Forests, Pretoria; the Forestry Experiment Station, Formosa; the College of Agriculture, Philippines; the Yokohama Nursery Co., Japan; Dr. T. H. Stephens, Manila; Messrs. Veitch & Sons, London; W. Bull & Sons, London; Russell & Co., Richmond; F. H. Bruning & Co., Melbourne; G. Regnard, Mauritius; A. Corazza, Italy; R. Hoffman, England; J. C. Harvey, Mexico; M. Herb, Naples; E. H. High, England; and R. Kanihere, Formosa.

31. Also from the following in the Island :—The Ceylon Agricultural Society; Lt.-Col. Paul; Messrs. John Still, A. J. van der Poorten, A. J. Kellow, E. G. A. Palmer, John Tilly, P. N. Braine, A. E. Rajapakse, E. W. Hartley, W. Wicherly, Mrs. C. Drieberg, Miss Westland, and Miss Tilly.

32. Plants and seeds have been issued gratis or in exchange to the following :—The Royal Botanic Gardens, Kew; the Botanic Gardens of Sydney, Paris, Nogent-sur-Marne, Rio de Janeiro, Marseilles, Java, Darwin, Lahore; the Government Horticultural Department, New Delhi; the Departments of Agriculture, Washington, Saigon, Zomba, San Jose; the Imperial Department of Agriculture, Barbados; the Agri-Horticultural Societies of Madras and Rangoon; the Forestry and Scientific Department, Entebbe; the Forest Department, Khartoum; the Experiment Station of Forestry, Taihoku; the Bureau of Forestry, Manila; Municipal Gardens, Bombay; State Gardens, Baroda; the Sudan Government Education Department, Khartoum; Biological Institute, Amani; Agricultural College, Dookie, Queensland; Agricultural Farm, Mandalay; Prof. Lorenzo A. Ruiz, Cuba; Messrs. Sander & Sons, England; A. Corazza, Italy; C. P. Cumming, Paris; J. N. Chakrawarti, Rangpur; M. Colani, Hanoi; A. E. Haliburton, Jamaica; A. Allegra, Catania; M. Herb, Naples; A. V. Coutts, Isle of Pines; J. A. Leopold, Perth, W. A.; J. C. Harvey, Mexico; H. J. Hoare, Peshawar; Oskar Sohum, Germany; C. Muller, Germany; F. F. Schultze, Texas; J. N. Standon, Chikalda; Charles Reukart, Villefranche, France; Mrs. Tewksbury, Melbourne; and Mrs. Zurocher, Quelimane.

33. And to the following in the Island :—His Excellency the Governor's Gardens; the Station Gardens, Cotta-road, Watawala, Ambalangoda, Kamburugamuwa, New Peradeniya, Homagama, Kalutara South, Jaffna, Chavakachcheri, Kadugannawa, Chunagam, Vavuniya, Kendangamuwa, Madawachchi; the Chief Resident Engineer, Mannar Railway; the School Gardens, Pussellawa, Madipola, Handessa, Keenadeniya, Bandaragama, Kobbekaduwa, Kengalla; the Stock Garden, Colombo; the Local Boards, Badulla, Puttalam, Matale, Negombo; the Police Stations, Cotta, Kurunegala, Kalutara, Negombo, Galle; the General Hospital, Colombo; Hospital Gardens, Moratuwa, Balangoda, Badulla, Koslanda, Ratnapura; the District Engineers, Trincomalee, Ratnapura, Avissawella, Dimbula; the Assistant Government Agents of Matara and Puttalam; the District Judges, Kalutara and Badulla; the Ragama Camp; the Assistant Conservator of Forests, Kurunegala; the Post Offices, Peradeniya and Deniyaya; the Resthouse, Deniyaya; the Ceylon Agricultural Society; and the Experiment Station, Peradeniya.

RAINFALL.

34. The rainfall for each of the last two years has been abnormal, that for 1912 being 6·72 in. below the average, and that for 1913 nearly 32 in. above the average. The rainfall for the latter year was the heaviest on record, and included three heavy floods, viz., in January, October, and December. The last flood was the highest on record at Peradeniya and up-country generally. October was the wettest month with over 32 inches, and February the driest with '91 in. The heaviest fall in any 24 hours in 1912 was 4·63 inches (measured on July 10), and in 1913 7·34 inches (measured on October 6).

35. The following is the rainfall for 1912 and 1913, with the average for each month for the last thirty years :—

Months.	Rainfall for 1912.			Average, 1884 to 1912, inclusive.		
	Inches.	Days.		Inches.	Rainfall.	Days.
January	·39	2	..	3·01	..	7
February	—	—	..	1·81	..	4
March	4·74	7	..	4·61	..	8
April	5·83	9	..	8·56	..	14
May	4·20	8	..	6·14	..	11
June	9·79	21	..	10·46	..	20
July	15·08	16	..	8·31	..	19
August	4·59	16	..	6·15	..	17
September	2·44	8	..	6·81	..	15
October	10·89	24	..	13·57	..	21
November	9·67	19	..	10·10	..	17
December	14·84	17	..	8·70	..	13
Total	82·46	147		88·18		165

Months.	Rainfall for 1913.			Average, 1884 to 1913, inclusive.		
	Inches.	Days.		Inches.	Rainfall.	Days.
January	22·29	21	..	3·65	..	7
February	·91	5	..	1·78	..	4
March	3·99	5	..	4·59	..	8
April	9·26	15	..	8·59	..	14
May	4·43	6	..	6·08	..	11
June	7·21	12	..	10·29	..	19
July	5·54	15	..	8·22	..	19
August	5·20	13	..	6·12	..	16
September	2·22	8	..	6·66	..	15
October	32·03	21	..	14·18	..	21
November	11·14	17	..	10·14	..	17
December	16·18	18	..	8·95	..	13
Total	120·40	156		89·25		165

H. E. THE GOVERNOR'S GARDENS, &c.

QUEEN'S HOUSE GARDEN.

36. This has been maintained in good order as usual. The row of screw-pines (*Pandanus*) which lined the boundary wall on the seaside have all been removed, on the advice of Major James, the mosquito expert. A border of ornamental shrubs lined by a wide path has been made along the wall in place of the screw-pines removed, with several fine flowering trees planted at intervals at the back. Some two dozen of the older trees and palms which grew close to the house in front have been cut down.

KING'S PAVILION GARDEN.

37. The beautiful garden and grounds of the King's Pavilion have undergone some improvements around the plant-shed and rose-garden. As at Queen's House, a number of handsome "traveller's trees" (*Ravenala madagascariensis*), which formed a striking feature here for many years, and of other plants with adaptations for collecting water in their leaf bases, were cut down on medical advice, with a view to reducing the number of mosquitoes.

THE LODGE GARDEN.

38. With the appointment of a permanent gardener here in charge of the grounds and coolies, it has been possible to improve the general state of these gardens. Much superfluous growth has been cleared, and some bamboos were thinned out so as to improve the view of the surrounding hills. The bank above the bungalow has been sloped and put under grass, with some flower beds dotted about. An ornamental mixed hedge has been planted on the upper side along Lady Horton's walk, so as to secure more privacy.

QUEEN'S COTTAGE GARDEN.

39. Several improvements were carried out. The lawns were top-dressed and several depressions filled in. The grass banks near the tennis court were re-turfed, and the designs of some of the flower beds in front of the house were altered. The banks along the new drive were planted up with suitable plants, including *Solanum jasminoides*, Australian Daisy, *Tropæolums*, and Rambler Roses.

VEGETABLE GARDEN.

40. A large number of cauliflower and cabbage plants were lost owing to the club-root disease, in spite of liberal applications of lime to the soil and the practice of crop rotation as far as possible. Hares and rats did considerable damage to the vegetables.

LORANTHUS.

41. Large quantities of the Loranthus parasite were cut from the *Acacia melanoxylon* trees, many of the branches of which had to be cut off in order to get rid of it. The parasite is spread through the agency of the flower-pecker bird (*Dicæum erythrorhynchum*), the smallest of Ceylon birds and the only one so far known to feed on the berries of the Loranthus.

BOTANIC GARDENS, HENARATGODA.

ORNAMENTAL BEDS.

42. The ornamental beds have been overhauled and manured three times in the past year. The watering of these in the dry weather has involved a considerable amount of labour, owing to the scarcity of water. Some new ornamental beds have been laid out.

IMPROVEMENTS.

43. Towards the end of the year (1913) a considerable number of superfluous or unsightly trees were cut down and removed. This will result in an improvement of the trees and plants remaining, as well as in the lawns and general appearance of the Gardens.

PROPAGATION.

44. Three plants of *Amherstia nobilis* have been successfully propagated by layering (gooteing), and these have been planted out in suitable places in the Gardens.

IPECACUANHA.

45. A larger plot has been devoted to the propagation of this product in order to meet the increasing number of applications for plants. It requires a position under the permanent shade and shelter of trees, with a moist humous soil.

PRICKLY PEAR COMMISSION.

46. A travelling commission, under the superintendence of Dr. Johnston from Queensland, visited the Gardens late in 1912 and instituted an experiment with the object of discovering a satisfactory method of exterminating the prickly pear pest in Queensland, by means of a scale insect. This experiment is still proceeding, a special enclosure being devoted to it.

REVENUE.

				Amount.
				Rs. c.
47.	The following is a statement of revenue for the year 1913 :—			
	From sale of flowering plants, &c. . .	..	..	48 0
	Do. rubber plants, &c. . .	..	..	45 0
	Do. rubber seed . .	..	..	286 0
	Do. firewood and logs . .	..	..	40 0
	Do. cinnamon . .	..	..	8 0
	Do. rubber biscuits, &c. . .	..	..	2,296 47
Total . .				2,723 47

METEOROLOGICAL.

48. During the middle part of the year (1913) very strong wind was experienced which caused injury to many of the full grown 22-year old Hevea trees of the second generation. The following table shows the monthly rainfall for 1912 and 1913, and the number of days on which rain fell in each month :—

Month.	Rain. Inches.	1912. Days.	Rain. Inches.	1913. Days.
January ..	0·42 ..	1 ..	8·98 ..	14
February ..	3·20 ..	2 ..	4·49 ..	6
March ..	8·95 ..	8 ..	5·74 ..	5
April ..	12·87 ..	18 ..	6·31 ..	12
May ..	19·72 ..	23 ..	8·68 ..	13
June ..	23·41 ..	28 ..	8·04 ..	10
July ..	4·21 ..	10 ..	4·87 ..	10
August ..	3·04 ..	12 ..	— ..	—
September ..	5·77 ..	9 ..	3·62 ..	7
October ..	21·26 ..	20 ..	10·29 ..	15
November ..	5·97 ..	15 ..	15·02 ..	20
December ..	4·54 ..	7 ..	10·38 ..	16
Total ..	113·36	153	86·42	128

49. I attach the report of the Curator of the Botanic Gardens, Hakgala.

H. F. MACMILLAN,
Superintendent of Botanic Gardens

BOTANIC GARDENS, HAKGALA.

IMPROVEMENTS.

THE bank immediately above the entrance gate was re-sloped and planted up with ornamental shrubs, &c. The patana bank outside the entrance was cut back about 12 feet by the Garden and Public Works Department coolies during October, 1913, in order to make the turn easier for motors, especially those entering or leaving the Gardens by the main road below Hakgala.

BUILDINGS, &c.

2. The new summer arbour erected in memory of the late Curator was furnished in August, 1913, with tables and chairs made mostly out of rhododendron wood.

PLANT HOUSES.

The common kinds of ferns from the small lower greenhouse were removed and planted out in the fernery, their place being taken by the orchids which were removed from the greenhouse.

ROSE GARDEN.

3. The beds were well manured and a quantity of clay added to the soil. Several old plants, which had not been flowering well, were taken out and their places filled by better varieties received from Messrs. Benjamin Cant & Sons, England, such as Souvenir de S. A. Prince, Lady Ashtown, Hugh Dickson, Her Majesty, Madame Pernet, Monsieur Paul Ledé, Etoile de France, Prince Arthur, Pharisaer, Bessie Brown, Tom Wood, Barbarossa, and Maman Cochet.

The following varieties do best in the Gardens :—Souvenir de la Malmaison, Safrano, Gruss au Teplitz, Enchantress, Frau Karl Druschki, Caroline Testout, Mrs. B. R. Cant, Madame Charles, Charlotte Corday, Amazon, Lady Waterlow, Dupuy Jamain, William Allen Richardson, Pharisaer, Corrina, and Madame Pernet Ducher.

NURSERY.

4. This has been well stocked, and a large number of Cupressus macrocarpa and Knightiana were raised from seed. The labelling was thoroughly overhauled and brought up to date.

FERNERY.

5. A considerable number of plants were put out here, including a number of named orchids, such as Coelogyne cristata, C. ochracea, Dendrobium aureum, D. nutans, Aerides cylindricum, Saccobolium roseum, S. niveum, S. brevifolium, Cirrhopetalum Wightii, S. grandiflorum, Vanda spathulata. In addition to these, a few well grown plants of Lycopodium squarrosus and L. phyllanthum were put out.

FRUIT GARDEN.

6. Several fruit trees have been recently planted here, such as Pomegranate (*Punica granatum*), Tree Tomato ("yellow" and "blood-red" varieties), China Guava (*Psidium Cattleianum*), Loquat (*Eriobotrya japonica*), and a number of Apples and Pears. Some were also planted out in the waste piece of ground opposite the new propagating sheds and are growing well. The Cherimoyer (*Annona Cherimolia*) trees continue to produce a few fruits each season, but they are very small, being only about the size of a cricket ball. A few very fine fruit were grown on Albion estate the last two seasons, some of them weighing over two pounds, and were well flavoured.

The Persimmon or Chinese Date Plum (*Diospyros kaki*) of Japan produced a few fruits.

THE PONDS.

7. Both these were cleaned out in September last. The path round the upper pond was widened and re-turfed. Seven tubs containing White Azalea, *Begonia metallica*, *Begonia* sp., *Begonia* Mrs. Baker, *Agave americana* variegata, Grass variegated, and *Salvia splendens* (Scarlet Queen) were put round the edge, and the garden seat opposite the harbour painted. The edges of the lower pond were planted with *Phormium tenax*, *Crinum giganteum*, *Alsophila crinita*, *Begonias*, *Arum lilies*, &c. A new outlet pipe was fixed, and a retaining wall built at the upper end to prevent wash. The *Crinum giganteum* on the borders of the upper pond were in full bloom during August and made a very pleasing effect; on one clump 75 flowers were out at once.

ACACIA DECURRENS VAR. MOLLISSIMA.

8. Black Wattle.—A packet of seeds of this wattle was received on October 12, 1912, from the Chief Conservator of Forests, Pretoria, through Peradeniya, and the seeds were sown in two beds in the nursery. Some being soaked in warm water for 12 hours were sown on October 13 and germinated on the 20th. Unsoaked seeds, sown on the same day, germinated four days later. In all about 250 seedlings were raised. Of these, 35 were planted out on the cleared piece of ground below the *Casuarina* plantation on October 24, 1913, and are growing well. Eighty-four plants were put out on December 20, 1913, in a cleared plot of ground on the patana beyond the laboratory. Unfortunately dry weather set in before the plants had time to become established, and consequently they were severely checked. The remainder of the plants are still in the nursery, and will be planted out when the weather is favourable.

SOYA BEANS (GLYCINE HISPIDA).

9. Ten pounds of seed of this bean were received from Peradeniya for trial at Hakgala and Nuwara Eliya on February 9, 1913. Three small plots were tried at Hakgala.

No. 1 Plot, Patna.—One pound of seeds were sown on February 12 in two unmanured beds on the cleared piece of ground below the *Casuarina* plantation. The seeds germinated on the tenth day after sowing. The plants were in flower at the end of April and the beans collected on June 4, the yield from the pound of seeds being 15 oz. Unfortunately hares did a certain amount of damage to this plot one night, and it was fenced in next day to prevent further damage being done.

No. 2 Plot, Vegetable Garden.—Two pounds of seeds were sown in manured beds on February 12 and germinated seven days after sowing. The plants were in flower on April 15 and the seed collected on June 6. The yield from this plot was 5 lb. 3 oz.

No. 3 Plot, Old Rock Garden.—Two pounds of seeds were sown in well-dug old nursery beds on February 12 and germinated seven days later. The plants were in flower on April 19. The yield was very poor, being only 9 oz. more than the quantity sown.

The total yield of the three plots was 8 lb. 11 oz.

KOKIA ROCKII.

10. A packet of seeds of this was received from the United States Department of Agriculture in May, 1913. The majority of the seeds were sent to Peradeniya, only 12 being kept here for trial; out of these 2 plants were raised. One of them damped off, but the other is growing well, and is about 7 inches high. The seeds were treated in three different ways before sowing, namely: (a) soaking in hot water for 12 hours, (b) slightly cracking the seeds, (c) clipping the seeds at the opposite side to the hilum. The two plants raised were from seeds which had been soaked in hot water for 12 hours; all the others failed to germinate.

HEDYCHUM CORONARIUM.

11. The plants in the small plot which was planted up in the swampy piece of ground above the fernery during March are growing very slowly. A few were planted at the same time in the grass, and these seem to be doing better than those in the plot specially cleared for their reception.

HEDYCHUM FLAVESCENS.

12. The plot of plants from which 1,800 stems were cut and sent to Peradeniya in May has grown up again. Some of the stems are fully matured and are only about 5 feet high, i.e., 2 feet lower than the stems cut in May, and the plants look very weak and unhealthy.

INTERCHANGE OF PLANTS AND SEEDS.

13. Plants or seeds were issued gratis or in exchange to the following:—Botanic Gardens, Lalbagh; Bieton Gardens, Devonshire; Department of Agriculture, U. S. A.; M. Herb, Italy; and the following in the Island: Government Agent, Ratnapura; Judges' Bungalows, Kandy and Nuwara Eliya; Local Boards, Hatton, Dikoya, Bandarawela, Ratnapura, Nuwara Eliya; Forest Department, Nuwara Eliya; H. E. the Rear Admiral's bungalow, Diyatalawa; R. N. Camp, Diyatalawa; Registrar-General's bungalow, Nuwara Eliya; the Ceylon Agricultural Society; Queen's Cottage Gardens, Nuwara Eliya; Brigadier-General, Nuwara Eliya; Station Master, Ambawela; Victoria Park, Colombo; hospital grounds, Dimbula and Ratnapura; District Engineer, Diyatalawa.

VISITORS.

14. The number of visitors to the Gardens during the year 1913 was 4,306.

OFFICE.

15. The letter register shows as follows:—Inward 1,413, outward 2,016, for the eighteen months under review.

INTRODUCTIONS.

16. The following are the principal additions made to the collections :—

<i>Acacia confusa</i>	..	(Experiment Station of Forestry, Japan)
<i>Acacia decurrens</i> var. <i>mollissima</i>	..	(Chief Conservator of Forests, Pretoria)
<i>Acacia pycnantha</i>	..	(M. Herb, Naples (re-introduced))
<i>Agrimonia eupatoria</i>	..	(Peradeniya)
<i>Araucaria imbricata</i>	..	(Bicton Gardens, Devonshire)
<i>Bletia hyacinthina</i>	..	(E. G. A. Palmer, Madulsima)
<i>B. h. purple</i> var.	..	do.
<i>Chamæcyparis obtusa</i>	..	(Yokohama Nursery Co., Ltd., Japan)
<i>Cypripedium adrastus</i>	..	(E. G. A. Palmer, Madulsima)
<i>C. albertianum</i>	..	do.
<i>C. ashburtoniæ</i>	..	do.
<i>C. barbatum</i>	..	do.
<i>C. Boxalli</i>	..	do.
<i>C. callosum</i>	..	do.
<i>Juniperus pachyphœ</i>	..	(U. S. Department of Agriculture, Washington)
<i>Kokia Rockii</i>	..	do.
<i>Lagerstrœmia subcostata</i>	..	(Experiment Station of Forestry, Japan)
<i>Lucerne</i> , Peruvian	..	(Ceylon Agricultural Society)
<i>L. Turkestan</i>	..	do.
<i>Pinus densiflora</i>	..	(R. Kanehara, Formosa)
<i>P. massoniana</i>	..	(Yokohama Nursery Co., Ltd., Japan)
<i>Quercus glauca</i>	..	(Experiment Station of Forestry, Japan)
<i>Smanisoma atrocarminea</i>	..	(M. Herb, Naples)
<i>Stephania elegans</i>	..	(Royal Botanic Gardens, Calcutta)
<i>Vitis rumicisperma</i>	..	do.

METEOROLOGY AT HAKGALA.

17. The rainfall for 1913 was 133·70 inches, or 36 inches above the average for the last twenty nine years. The wettest month was January (37·59 inches), and the driest September, with only 1·46 inch. The greatest number of rainy days in any month was in January, when rain fell on 28 days. The greatest fall in any 24 hours was 6·27 inches, registered at 9.30 A.M. on December 16.

18. The following table shows the rainfall for 1912 and the averages for the last 28 years :—

Months.	Rainfall for 1912.		Average, 1884 to 1912, inclusive.	
	Inches.	Days.	Inches.	Days.
January	7·13	7	8·85	16
February	0·70	3	3·21	8
March	5·12	13	4·86	10
April	3·89	16	7·26	16
May	8·93	15	6·92	15
June	4·72	22	8·24	20
July	6·48	23	6·70	20
August	4·84	18	4·48	16
September	2·78	14	6·28	18
October	10·99	26	12·64	23
November	17·35	22	11·87	21
December	21·53	28	14·39	22
Total	94·46	207	95·70	205

19. The mean temperature of the air and the range for each month in 1912 is given in the following table :—

Months.	Mean.	Range.
	Fah.	Fah.
January	63·5	30·2
February	66·9	29·7
March	69·4	26·2
April	69·4	24·2
May	70·7	22·7
June	67·4	28·3
July	59·8	28·8
August	67·7	33·8
September	70·4	33·3
October	67·2	27·8
November	64·2	32·3
December	63·8	27·8

20. The following table shows the rainfall for 1913 and the averages for the last 29 years :—

Months.	Rainfall for 1913.		Average, 1884 to 1913, inclusive.	
	Inches.	Days.	Inches.	Days.
January	37·59	28	9·84	16
February	6·53	10	3·32	8
March	5·56	9	4·89	10
April	8·13	17	7·29	16
May	8·24	23	6·97	15
June	4·72	16	8·11	19
July	7·90	22	6·74	20
August	4·20	20	4·47	16
September	1·46	10	6·11	18
October	16·83	21	12·79	23
November	7·82	23	11·73	21
December	24·72	22	14·75	22
Total	133·70	221	97·01	204

21. The mean temperature of the air and the range for each month in 1913 is given in the following table :—

Months.			Mean, Fah.		Range. Fah.
January	..	..	62·4	..	24·7
February	..	..	54·4	..	28·9
March	..	..	69·6	..	27·4
April	..	..	71·6	..	27·6
May	..	..	70·9	..	22·0
June	..	..	68·3	..	20·6
July	..	..	65·5	..	15·8
August	..	..	67·2	..	22·4
September	..	..	70·0	..	24·8
October	..	..	67·5	..	21·5
November	..	..	65·1	..	16·5
December	..	..	62·9	..	27·6

22. The highest temperature in the sun's rays was 154·4 on March 30, against 154·7 Fah. for June 10 of the previous year. The lowest temperature on the grass was 32·4 on March 20, against 31·0 on February 18 and November 6 of the year before.

23. The cloudiest months in 1913 were July, November, and December, with a mean amount of cloud of 8·0, against 5·0 in June, July, October, November, and December of the previous year.

24. The brightest month in 1913 was March, with a mean amount of 3·0.

25. The value of plants and seeds given gratis to Government institutions from the Hakgala Botanic Gardens was as follows :—

				Rs. c.
July to December, 1912	..	..	..	12 50
January to December, 1913	..	..	..	1,315 0
Total	..			1,327 50

26. The receipts were as follows :—

				Rs. c.
July to December, 1912	..	..	..	205 75
January to December, 1913	..	..	..	509 75
Total	..			715 50

NUWARA ELIYA EXPERIMENT GARDEN AND PARK.

27. The principal work has been the upkeep of the grounds. The lawns were top-dressed, the paths re-gravelled, and the beds and borders kept in good order.

BUILDINGS.

28. All the plants from the greenhouse were removed to Hakgala in August last, and will be returned as soon as the greenhouse has been rebuilt. A new meteorological shed was erected on the lawn opposite the post office.

GENERAL.

29. A great deal of damage was done to the borders and paths during the flood in December, 1913, and a large number of plants lost. The lawns were covered with mud, and the wooden bridge opposite the post office was washed away and deposited on the waste land between the Park and race-course.

30. The following seeds were received from the Chairman, Board of Improvement, and are to be raised for planting out in Nuwara Eliya :—*Abies Douglasi*, *Cupressus Lawsoniana*, *Eucalyptus paucifolia*, *Picea nobilis*, *Pinus canariensis*, *P. sylvestris*, and *Wellingtonia gigantea*.

THE MAZE.

31. A wire fence was put round the Maze by the Board of Improvement in October. A gate was erected at the entrance, and is kept open to the public from 7 A.M. to 11 A.M. and from 2 P.M. to 6 P.M.

EXPERIMENTS.

32. Of the 10 lb. seed of the Soya bean (*Glycine hispida*) received from Peradeniya in February, 5 lb. were sent to the Nuwara Eliya Garden for trial. The seeds were sown on the 11th of the same month and germinated on the 19th. The plants produced $\frac{1}{4}$ of a bushel of seeds, and these were sown on September 16, germinating in 7 days, but unfortunately the plants were destroyed by the heavy rains in October.

ACACIA DECURRENS VAR. MOLLISSIMA.

33. From the seeds sent up for trial, 250 plants were raised. These were planted out near the river, but all except 50 were washed away during the flood on December 16, when the whole of the Park was under water.

JAMES J. NOCK,
Curator, Hakgala Gardens.

REPORT OF THE SUPERINTENDENT OF LOW-COUNTRY PRODUCTS AND SCHOOL GARDENS.

STAFF.

THE headquarters of the Office of the Superintendent were moved to Peradeniya in October, 1912. The following changes were made in the clerical staff during the period under review :—Mr. W. B. Nonis was transferred in July, 1913, to the Colombo Museum, and Mr. C. D. W. Kannangara from the Colonial Secretary's Office succeeded him as Chief Clerk. Mr. A. D. L. de Zoysa Jayatilleke was appointed as an Agricultural Instructor from August, 1913, and Mr. E. P. Rupesinghe from the Department of Education succeeded him as assistant clerk.

2. Certain changes were also made with reference to the Inspecting Staff. These officers, previously known as Assistant Superintendents of School Gardens, are now designated Inspectors of School Gardens, and have each a definite area to look after. Mr. Alexander Perera has charge of the Central, Uva, Sabaragamuwa, and Eastern Provinces, Mr. D. D. Fernando of the Western and Southern Provinces, and Mr. C. Wickramaratne of the North-Western, North-Central, and Northern Provinces.

3. During the period under review Mr. Perera travelled 2,168 miles and paid 187 visits of inspection; Mr. Fernando 1,955 miles and 267 visits; and Mr. Wickramaratne 2,650 miles and 297 visits.

STOCK GARDEN.

4. 8,288 packets of seed and 4,496 plants and cuttings were issued to school gardens.

5. Two assistant teachers of Government vernacular schools and three probationary Agricultural Instructors were attached to the Stock Garden for training.

6. Distribution of seeds was facilitated by supplies received from 49 school gardens. The nurseries of different varieties of fruits were replenished as each variety came in season, and they are now well stocked. The natural order garden for students has been improved and added to. Two plant sheds have been erected and seats provided for visitors. New labels for plants have been provided, and direction boards set up to indicate the different sections of the garden. The testing of seeds for the Agricultural Society was done as hitherto. Four hives of *Apis indica* bees were stocked and supplied to applicants.

SCHOOL GARDENS.

7. There are now 282 Government school gardens, and 47 aided schools have been registered for the grants now payable by the Education Department, viz., Rs. 50 for a garden of an acre or more and Rs. 30 for one not less than one-third of an acre in extent.

8. A "Junior Agricultural Reader" was prepared by me for the Department of Education, to be used in vernacular schools. A Senior Reader is in course of preparation. A circular containing instructions on the planting of school gardens was issued to teachers.

9. The results of the work going on in the school gardens are satisfactory and encouraging, and continue to have a healthy influence on the boys and their surroundings. The provision of an enhanced prize fund of Rs. 2,500 now admits of a more equitable distribution of awards than hitherto. Half the sum awarded to each garden is divided among the five students who show the best work both in school and home garden. In the annual judging for prizes the following schools received awards :—

WESTERN PROVINCE.

Colombo District.—Mugurugampola, Hunumulla, and Kirindiwela.

Kalutara District.—Bellana, Paragastota, Walalla-wita, and Kalupahana.

SOUTHERN PROVINCE.

Galle District.—Nagoda, Magedara, and Polpogoda.
Matara District.—Rotumba, Kotapola, Naran-deniya, and Marambe.

Hambantota District.—Mandaduwa, Walasmulla, and Katuwana.

CENTRAL PROVINCE.

Kandy District.—Ankumbura, Mahamedagama, Udipattu, Nugawela, Mahagama, and Rambukpitiya.
Matale District.—Madawala Ulpota, and Madipola.

PROVINCE OF UVA.

Tennepanguwa and Passara.

PROVINCE OF SABARAGAMUWA.

Ratnapura District.—Opanaika, Madampe, Dippiti-gala, and Balangoda.

Kegalla District.—Weragala, Kotapola, and Bedde-wela.

NORTHERN PROVINCE.

Mullaittivu District.—Etambagaskada.
Mannar District.—Iranai Illuppaikulam.

NORTH-CENTRAL PROVINCE.

Galediulwewa, Mahadiulwewa, Morakewa, Maha-mankadawala, Ratmalgahawewa, Tamuttegama, Irambakulama, and Mahaelagomuwa.

NORTH-WESTERN PROVINCE.

Buluwela, Makandura, Nakkawatta, Balalla, Kan-kaniyamulla, Ambanpola, Wariyapola, and Giriulla.

PADDY.

10. The cultivation of paddy is among the Sinhalese a matter not so much of agricultural enter-prise as of social economy, and the production of rice for the consumption of his household is more or less a moral obligation on the cultivator. Where the people have been imbued with the spirit of commercial enterprise this sentiment has given way; but in the remoter parts of the Island, and particularly in the Kandyan districts, it still holds sway, and to eat any but home-grown rice is a reproach.

11. The attractions of coconut cultivation (and even of rubber and tea) have also helped to modify the conditions of village life, and many landowners have given up paddy cultivation with all its risks for the less strenuous life and more certain results associated with the growth of perennial crops.

12. The increase of the local output of paddy, which is so much desired at the present time in connection with the food supply for estate labour, is possible (1) by extending the area under the crop, and (2) by improving the yield of the land at present under cultivation.

13. The opening up of new areas, chiefly in the North-Central Province and the lower portion of the Northern Province, is hardly likely to take place without the intervention of the large capitalist, or the enterprise of the Moorish cultivator from the Eastern Province or the Tamil settler from South India ; and with a view to attracting them, it would be necessary to allow land on very easy terms.

14. The question of improving the local yield of paddy by better methods of cultivation has occupied the serious attention of Government since the early eighties, when a School of Agriculture was established mainly to help the native agriculturist. The possibility of raising better crops depends on (1) better tillage, (2) improvement in sowing, and (3) manuring.

15. The officers of the Department have consistently preached and demonstrated the advantages (1) of using improved implements of tillage, in order to bring about a more thorough preparation of the soil with a view to increasing the stock of available plant food and effectually suppressing weed growth ; (2) of saving seed paddy and promoting better growth by transplanting seedlings from a nursery by reducing the sowing rate in broadcasting ; (3) maintaining the fertility of the land by the application of manure.

16. Under the first head the progress made has been slow, the real difficulty in effecting any improvement on the existing type of implements being the poor character of the cattle available for agricultural purposes ; and until the large question of cattle improvement is taken in hand, any extensive alteration in the methods of tillage is not to be expected. The co-operation of the more enlightened landowners (*e.g.*, Messrs. A. E. Rajapakse, V. Cassipillai, and Bibile Ratemahatmaya), who have adopted a better type of plough, has gone a great way towards convincing the village cultivator of what can be done in this direction.

17. "Transplanting" in paddy cultivation is being taken up, chiefly in the Central and Uva Provinces, and the aim at present is to gradually reduce the number of seedlings planted together. A large number of demonstration plots have been worked to prove that there is no object in planting more than three seedlings together, and that planting should not be done less than 6 in. by 6 in. apart. The prospect of transplanting being adopted, wherever local conditions admit, is now more promising.

18. The advantage of adopting a reduced sowing rate in broadcasting is not likely to be appreciated till better tillage comes to be practised, since the suppression of weeds is ordinarily effected by thick sowing and keeping the land under water. It may not be generally known that in some parts of Uva no less than five bushels of seed are sown per acre. The least known seed rate is two bushels, while with proper cultivation a bushel should suffice.

19. The Agricultural Chemist of the Madras Department has expressed the view that "wet" paddy grows under anaerobic conditions. If this be admitted, the questions (1) whether this character of the paddy plant has not been induced by environment, and (2) whether it could be altered without detriment, and indeed with advantage to growth and productiveness, are worth investigation.

20. In this connection it may be mentioned that the experience at Sivagiri Farm (Tinnevely District) has been that very much smaller quantities of water than are usually employed yield entirely successful results, and that it is an advantage to withhold irrigation water until the surface soil begins to crack.

21. As regards manuring, the practice of growing a leguminous green crop to be ploughed in when preparing the field has been found to be the most satisfactory and economical method of fertilizing paddy. This is being demonstrated at different centres, and the results appeal to the paddy grower. The only commercial fertilizer that has so far found favour with cultivators is bone meal ; and the employment of green manures supplemented with bone meal will probably come to be generally adopted.

FRUIT.

22. A great deal has been done for the improvement and spread of fruit culture in the Island. The demand for fruit increases yearly owing to a growing population and an expanding port. Among the most important indirect advantages of school gardens is that they act as centres for the spread of fruit culture, since every school garden has a section devoted to fruits. In this way varieties which were once unheard of in certain localities have been now established, and their propagation through the agency of the school children is only a matter of time. As a case in point it may be mentioned that grafted mangoes of the best varieties are now fruiting in remote parts of the North-Central Province.

23. The Agricultural Society has greatly assisted in this work by large distributions of fruit plants among its members and through the gardens worked under its auspices.

VEGETABLE PRODUCTS.

24. Much that has been said in regard to fruit may also be said with reference to vegetables, the cultivation of which has been greatly encouraged through school gardens. Vegetable cultivation appeals more forcibly to the villager, in that he can quickly add to his food supply by growing seeds obtained from school gardens. Indeed, one of the most gratifying results of the school garden movement has been the starting of what are known as "home gardens," *i.e.*, gardens established near their dwellings by the school boys. By this means the cultivation of a number of useful vegetables has been taken up in villages, *e.g.*, Lima beans, Chinese cabbage, Guar bean, Cluster sweet potato, &c.

TOBACCO.

25. Tobacco cultivation has so far only supplied a local demand, except in the case of chewing tobacco, the bulk of which finds a market in Travancore State ; but this is gradually being closed against Ceylon. For the Jaffna peninsula, which is very largely devoted to tobacco, what is wanted is a type of leaf that will command a wider market than that now raised. The Department has arranged for the employment of a tobacco expert, and it will be for him to find a practical solution to the difficulty which the Jaffna people have to face. In the meantime a suitable tract of land has been secured near Jaffna for conducting the necessary preliminary experiments.

26. In the Central Province the situation is somewhat different, since here a variety of tobacco believed to have been introduced forty or fifty years ago from Cuba has become naturalized, *i.e.*, acclimatized and modified to local conditions. This variety is being extensively grown in Dumbura, Matale North, and Hewaheta, and its cultivation is spreading. The leaf is, as far as local leaf goes, comparatively small, of a fine texture, and has been found after proper curing more suitable for the

manufacture of cigars of the European type than the tobacco of the North. Recognizing this fact, a local firm has established a curing shed and cigar factory at Teldeniya, and is in this way assisting in the development of an industry which promises to prove of great benefit to the people of the surrounding districts.

COTTON.

27. Cotton cultivation is still in the experimental stage, and definite information as to the most suitable regions and varieties is after repeated trials only now being acquired. The results obtained at Ambalantota (in the Hambantota District) last season were very encouraging, and a further trial is being made in the same locality this season. The yield of seed cotton from 1 acre 2 roods 34 perches was 1,826 lb., of which 1,558 was first grade. After ginning, the lint, which weighed 373 lb., was sent to the British Cotton Growing Association, Manchester, and fetched 9½d. per pound first quality and 7½d. second quality, with American middling at 7·35d.

28. The Assistant Government Agent, Hambantota, has granted concessions to *chena* cultivators in order to encourage them to grow cotton on their lands, and 30 to 40 acres have been planted this season. Judging by the figures supplied by the local agents of the British Cotton Growing Association showing distribution of cotton seed, there should be an area of not less than 200 acres under the crop this season. The variety selected for growing in the Island is Allen's long staple American upland.

C. DRIEBERG,

Superintendent, Division of Low-country Products and School Gardens.

February 16, 1914.

REPORT OF THE MANAGER, EXPERIMENT STATION, PERADENIYA.

MR. DUDLEY S. CORLETT took over the management on February 3, 1913.

HEVEA BRASILIENSIS.

2. The following experiments on various methods of tapping have been carried out on the ten-year old trees, and are still in progress :—

Excision.

- 1.— $\frac{1}{8}$ circumference, 4 cuts 1 foot apart, once a week.
- 2.— $\frac{1}{8}$ circumference, 4 cuts 1 foot apart, tapped twice a week.
- 3.— $\frac{1}{8}$ circumference, 2 bottom cuts 1 foot apart, three times a week.
- 4.— $\frac{1}{8}$ circumference, 2 cuts 2 feet apart, three times a week.
- 5.— $\frac{1}{8}$ circumference, 1 cut at 3 feet high, daily except Sundays.
- 6.— $\frac{1}{8}$ circumference, 3 cuts, alternate days, 1 foot apart.
- 7.—Basal V, alternate days.
- 8.—Full herring-bone, 2 cuts 1 foot apart, three times a week.
- 9.—Full herring-bone, 2 cuts 1 foot apart, alternate days.
- 10.—Full herring-bone, 2 cuts, daily, alternate months.
- 11.—Quarters, 4 cuts, alternate days.
- 12.—Quarters, 4 cuts daily on alternate months.

Incision.

- 1.—Northway's serrated knife, daily.
- 2.—Northway's serrated knife, alternate days.
- 3.—Bamber's pricker, vertical channels, 6 feet high, alternate days.
- 4.—Bamber's pricker, 3 feet from ground, alternate days.
- 5.—Bamber's pricker, 2 cuts $\frac{1}{4}$ inch apart, on opposite sides of the tree daily, every alternate fortnight.

3. The following plots, each consisting of two rows, have been manured with the following mixtures, and an unmanured row has been left between each for control; applied February, 1913 :—

	lb.		lb.
(1) Groundnut cake	300	(4) Excess of potash.	
Fish guano	150	Groundnut cake	200
Blood meal	100	Fish guano	100
Steamed bone dust	100	Blood meal	60
Sulphate of ammonia	40	Steamed bone dust	100
Muriate of potash	150	Muriate of potash	150
		Kainit	230
Per acre	840		
(2) Excess of nitrogen.		Per acre	840
Groundnut cake	300		
Fish guano	200		
Blood meal	150		
Steamed bone dust	20		
Sulphate of ammonia	90		
Muriate of potash	80		
Per acre	840		
(3) Excess of phosphoric acid.			
Groundnut cake	150		
Fish guano	200		
Steamed bone dust	200		
Muriate of potash	100		
Basio slag	190		
Per acre	840		
		(5) Nitrolim mixture.	
		Nitrolim	320
		Basic slag	170
		Sulphate of potash	174
		Per acre	664

4. Bulletins on the result of these rubber tapping and manuring experiments are in course of preparation.

5. Two new clearings of light jungle have been opened up on the hillsides, one of 11 acres 15 perches, called the "Hill Top" plantation, and the other of 7 acres 16 perches, called the "Hill Side."

The "Hill Top" plantation was planted in June, 1913, with Hevea rubber stumps, one year old, from seed of the old Peradeniya trees. The holes were made by dynamiting. $1\frac{1}{4}$ acre was planted in clumps of four 10 by 12 by 40 feet giving 69 trees per acre. $2\frac{1}{4}$ acres were planted in avenues 40 by 15 by 15 feet giving 112 trees per acre. The object of these two plots is to test the value of giving the trees plenty of air space and light at least in one direction. The remainder of this plantation is planted in rows 20 by 20 feet giving 108 trees per acre.

The whole of the "Hill Side" plantation is planted 20 by 20 feet. Owing to the steepness and exposure to the sun the stumps on this plantation did not take root so well as in the "Hill Top." In both plantations *Tephrosia candida* has been sown 4 by 4 feet, requiring about 3 lb. of seed per acre. On the "Hill Side" it did not germinate nearly so well as on the "Hill Top." Both plantations were supplied in August and again in October. In December the *Tephrosia candida* was cut down to a foot from the ground and mulched to the young trees.

6. Plots 14 and 15 of one-year old Hevea trees raised from seed from the famous No. 2 tree at Henaratgoda have been supplied with year old stumps raised from seed from the same source. Several failed by reason of the ensuing drought, though they were well mulched and watered. The plots were kept disc-harrowed and then sown broadcast with *Indigofera arrecta* 4 lb. to the acre. This has been cut once and mulched to the trees and when half-grown again ploughed in.

7. Plot 77 of year-old Hevea trees from No. 2 tree at Henaratgoda, half planted in dynamited and half in hand-dug holes, has been disc-harrowed and sown with *Crotalaria incana*, which has been mulched to the trees. No difference can yet be marked between the two methods of planting.

8. Plots 73 to 76.—These plots have been cleared of old cocoa and coconuts, and were planted in June in dynamited holes, with year-old Hevea stumps from old Peradeniya trees, in avenues 40 by 15 by 15 feet. One acre has been planted in groundnuts, and the other acre twice in green-grams, which were in each case ploughed in after half the crop was gathered. In December the young trees were mulched with dadaps.

9. Plot 67.—This is an acre plot at the end of the five acres of young cocoa, where the cocoa has all failed. Year-old Hevea stumps raised from a black-seeded variety at Henaratgoda have been planted in dynamited holes 33 by 33 feet and mulched with dadaps.

10. Plot 140 B.—An acre of steep, poor soil, newly cleared of bananas. Year-old Hevea stumps of the same black-seeded variety have been planted in dynamited holes 33 by 33 feet, the banana trash being buried round the trees. *Tephrosia candida* was sown, but failed to germinate. *Crotalaria striata* was sown in December.

11. Plot 140 C (below the reservoir).—Half an acre newly cleared of Sisal hemp, and planted in dynamited holes 33 by 33 feet with old Peradeniya stumps. Soil inclined to be marshy.

12. It will be observed that special attention is being given at Peradeniya to the question of spacing, with the object of ascertaining to what extent wide planting could be profitably practised.

MANIHOT GLAZIOVII.

13. Ceara rubber has been tapped by the following methods :—

- (1) Full herring-bone, 4 cuts 18 inches apart, twice a week.
- (2) Full herring-bone, 3 cuts 1 foot apart, 3 times a week.

Stabbing the trees, the method employed in East Africa, has not proved successful at Peradeniya, the yield being very disappointing.

MANIHOT DICHOTOMA.

14. This has been tapped in the following methods :—

- (1) Full herring-bone, 3 cuts 1 foot apart, three times a week.
- (2) Full herring-bone, 4 cuts 1 foot apart, twice a week.

Stabbing proved as unsatisfactory as in the case of *M. glaziovii*.

COCOA.

15. The crop for 1913 has been an exceptionally good one, and is still being picked. The dried cocoa has been very favourably reported on. That of the first quality commanded Rs. 62.75 per cwt. in Colombo. The crop from July, 1912, to December, 1913, was 245½ cwt., with an average price of Rs. 55.50 per cwt. for the best quality.

16. The dadaps having been unpruned for three years were all heavily pruned in April and May, as the shade had become too dense and canker prevalent. Canker has been systematically cut out, and all fungus pods collected and buried with lime.

17. Many trees rendered useless by disease have been cut down, and shoots allowed to come up from the stools. These should bear fruit sooner than if re-planted with young trees.

18. Plots 63 to 67 of five-year old *Forastero* cocoa have been systematically pruned every alternate month to get the trees into good shape. A fair number of trees are bearing for the first time. There appear to be four distinct varieties of pods, although the trees were all raised from seed from one tree.

19. A bulletin has been issued on the shading experiments carried out in these plots, and also on the manuring results in the old plots.

20. All the cocoa, except the Nicaragua, has been cured by being placed in small, cement vats lined with plantain leaves. It is left to ferment for three days, but each twenty-four hours it is uncovered and lightly washed, a bucket of clean water being poured over it and the cocoa lightly trampled. It is then taken out and again lightly washed and trampled in baskets, afterwards being spread in the sun, great care being taken to keep it constantly turned, especially the first day, when wet. The Nicaragua cocoa is fermented in a heap covered with plantain leaves, jute hessian, and a final covering of soil half an inch thick. It is kept thus for four days, but uncovered each day and thoroughly mixed, but without any water.

21. The cocoa crop is reckoned as from April to March. Though there are 80 acres, 40 acres are uncultivated, 15½ kept weeded but not manured, leaving 23 acres of manured plots under experiment. Manure has not been applied for two years. The yield from these 23 manured acres for the year 1912-13 is 14,161 lb. of dry cocoa of all grades, or 5½ cwt. per acre for the whole.

22. Taking 1,300 good pods to the hundredweight of first quality dry cocoa, we have the following comparisons :—

	Acres.	No. of good Pods.	Weight of good Cocoa. Cwt.	Yield per Acre. Cwt.
Manured ..	23	149,306	115	5
Unmanured but cultivated ..	15½	77,622	59½	3½
Uncultivated ..	40	26,229	20	½

Again, comparing the manured with the unmanured but cultivated and the uncultivated plots in the yield of good cocoa (excluding black cocoa), and taking 1,300 good pods to the hundredweight of good, dry cocoa, the 23 acres of manured plots yielded 149,306 pods, equal to 115 cwt., or 5 cwt. per acre. The unmanured but cultivated plots of 15½ acres yielded 77,622 good pods, equal to 59½ cwt., or 3½ cwt. per acre. The uncultivated and unmanured plots of 40 acres yielded 26,229 good pods, equal to 20 cwt., or ½ cwt. per acre.

COCONUTS.

23. Plots 53-62 consisting of seven-year old trees have borne nuts for the first time. The trees have responded well to ploughing and disc-harrowing.

Parts where the trees were small were let out to villagers for sowing kurakkan and vegetables as catch-crops and then re-ploughed, but this has not proved satisfactory, and will not be repeated, the crops not being properly weeded.

In plots 58 and 59 the three-year old *Tephrosia candida* having only been cut once since planting, and which had grown very rank in consequence, was uprooted and mulched to the trees, the land being ploughed.

24. Besides the Rhinoceros Beetle, the common Red Beetle (*Rhynosphorus signaticollis*) made its first appearance, and attacked several trees. Beetle traps have been instituted, but it is too early to state results as yet.

25. A nursery of nuts obtained from the same source as that of the original trees (Mr. G. T. Nicholas, Goluapokuna) has been set to fill up all vacancies.

26. A fine quality of copra has been obtained by first washing the nut and then carefully sun-drying. The price obtained was Rs. 96·25 per candy in November, 1913.

COFFEE.

27. There has been a considerable demand for seed of the so-called hybrid coffee (*Coffea canephora*) for local planting. Doubt exists as to whether this coffee has been correctly named, and investigations are being made.

28. The *Leucaena glauca* has been pruned and thinned out in three plots.

29. Plot 140 C of *Coffea robusta* has been extended one-tenth of an acre.

30. Green scale (*Coccus viridis*) has made its appearance for the first time on all the species of coffee, and spraying with a mixture of kerosine and whale-oil soap has been carried out. In the robusta plot the fungus *Cephalosporium lecanii* made its appearance; it has almost completely killed out the scale.

31. The hybrid trees planted in 1903 from seed obtained from Messrs. Leobenf of Paris were certified as immune from disease, but this year both the green scale and leaf disease are present, though only in small quantities, doing no injury to the plants. They have had no manure, but are bearing heavily.

32. The six-year old trees planted round the show plots and raised from seed from these trees are attacked both by the scale and the leaf disease (*Hemeleia vestatrix*) on a considerable scale. Several plants have been killed.

TEA.

33. The tea plot experiments have been continued. The plots are of 1 acre each. Plot 144 was planted with dadaps in January, 1912, and has been cut twice, yielding 688 lb. in January, 1913, and 1,566 lb. in December, 1913, to compare the effect of dadap manuring on Assam hybrid tea with the same on Manipuri indigenous. Plot 147, which was originally planted with *Crotalaria striata*, has been sown with *Tephrosia candida*. Plot 149 has had the dadaps out four times, yielding 11,397 lb. of green stuff.

34. The yield from the plots has been satisfactory.

35. All leaf has been weighed directly after plucking in the fields and again at the New Peradeniya Factory. The average price for the green leaf has been 6½ cents per lb.

36. All the plots have been pruned during the year, the five Manipuri Indigenous plots having run two years and yielding an average of 466 lb. of green leaf the month previous to pruning, plucking being to the fish leaf.

37. All plots have been manured with basic slag and potash in alternate rows at pruning, the prunings being mulched.

38. Slight traces of Shot-hole Borer have been found in plot 150, and the bushes are under observation for the pest.

39. A bulletin is being issued bringing the yields of the various plots up to December 31, 1913.

CROP YIELDS.

	1912.	1913.	Acreage.	Yield per Acre.
Tea (green leaf) ..	51,318 lb.	46,502 lb.	15	775 lb. made tea
Rubber ..	314 „	1,856 „	10	—
Cocoa ..	18,087 „	21,078 „	80	—
Coconuts ..	77,134 nuts	88,498 nuts	34	2,603 nuts

40. The drop in the yield in tea is owing to all the plots having been pruned in 1913 and being in full flush in 1912. The yield works out at 775 lb. of made tea per acre for 1913.

41. The rise in the yield of rubber is chiefly owing to the greater number of trees under experiment. But many of the trees are not being tapped, and as each row is a different method, the yield per acre cannot be given.

GREEN MANURES.

42. The *Leucaena glauca* No. 1 show plots yielded for the eighteen months in seven cuttings 1,027 lb. of green mulch, and No. 2 plot in six cuttings 846 lb. *Tephrosia candida* No. 1 plot (only half the bushes remaining) yielded in four cuttings 600 lb. *Crotalaria striata* one cutting yielded 299 lb.

FODDER GRASSES.

43. Over four acres of fine Guinea grass were washed away by the October flood, and new land had to be cleared along the river bank. This was re-planted 2 by 2 feet.

44. The December flood washed away another two acres, and left a deep deposit of sand and soil over all Guinea grass on the bank. This will entail re-planting the greater part during the next rains.

45. Teosinite (Reana) was sown in a small plot and gave a fine crop of green fodder. The seed has been collected for re-sowing on a larger scale and for distribution by the Agricultural Society.

LUCERNE.

46. A small plot of Indian acclimatized lucerne was sown in August and first cut in October, after which it has been cut once a month and is growing again. It has not been irrigated, and the crops have been light.

GRAIN.

47. Two small plots of Early American Cane and Undeniable Sorghum from Messrs. Brunnings, Melbourne, were sown in July, and yielded a good crop in September. The seed was collected and re-sown. In November plots 19 and 20, of 1 acre each, were divided into one-thirds and sown with Hickory King Maize, Ceylon Maize, and Sorghum. Plot 20 was ploughed and manured with 32 cart loads of cattle manure, and plot 19 with a mixture of muriate of potash 90 lb., nitrate of soda 180 lb., sulphate of ammonia 100 lb., coconut ash 150 lb. The former plot shows a markedly taller and healthier growth.

48. The Sorghums provide an excellent flour for native consumption and a good horse provender.

PADDY.

49. The yield from 3 acres planted with Dr. Lock's selected paddy transplanted in October, 1912, 12 by 12 inches, and harvested in March, 1913, was 94 bushels, which is at the rate of 31 bushels per acre. The greater part of the seed has been distributed by the Agricultural Society. The same plot was sown broadcast in April with yala paddy, yielding in July 144 bushels of paddy (or 44 bushels per acre) and 2,200 bundles of straw. The same plot was planted out again in November by transplanting, 6 by 6 inches, with Dr. Lock's selected paddy, the seed having not been specially selected this time, but taken from the bulk of seed from the last crop.

50. The nursery was manured with the following mixture:—Fish guano 38 lb., sulphate of ammonia 20 lb., horn meal 38 lb., precipitate of phosphorus 38 lb. The plots themselves have not been manured, as the land never sufficiently dries to allow of a green manure crop being sown. Both floods rose over the whole plot and left a beneficial silt behind.

REVENUE RETURNS.

51. From January 1, 1911, to June 30, 1912, Rs. 29,484; from July 1, 1912, to December 31, 1913, Rs. 28,085. The deficit of Rs. 1,399 is partly due to the drop in price of rubber, and partly to the fact that the cocoa crop is not yet all sold.

HOLING BY EXPLOSIVES.

52. All holing for rubber, cocoa, coffee, bananas, and fruit trees has been done by means of dynamite, both full and half cartridges being used. The cost worked out at 25 cents per hole, including cost of material and all labour of making and filling the hole ready for planting.

53. A demonstration of the use of dynamite in agriculture was given both at the Station and in the Royal Botanic Gardens by the agent of Messrs. Nobel's Hamburg Explosives Co., Ltd.

SUGAR CANE.

54. This plot has been cut, but the price offered for the canes was very low, and only a small quantity was sold. The canes are ratooning well.

VANILLA.

55. This was supplied with 8 foot cuttings in July. The plants have been heavily mulched with dadaps, indigo, and sugar cane trash.

HEDYCHIUM.

56. Two small plots of *H. coronarium* and *H. flavescens* were planted in July. One plot in a marshy soil of the paddy field has done poorly; the other on the river bank by the bananas is doing well, but is slow of growth.

FRUIT PLOTS.

57. Sapodilla, cherimoya, lemons have been added to the plots. Grafting of lemon to orange stocks has been carried out.

58. Vegetables, both European and native, have been grown to show how a profitable kitchen garden should be carried on. Tomatoes fetched high prices, and other vegetables and fruits have sold well.

BANANAS.

59. Plot C, $\frac{3}{4}$ of an acre, was planted in June in dynamited holes 12 by 12 feet, containing each a pound of the following mixture :—Castor cake 140 lb., fish guano 167 lb., precipitated superphosphate 112 lb., sulphate of ammonia 150 lb., muriate of potash 100 lb. The varieties are *kolikuttu*, *suwandel*, and *hondarawalu*. This plot was twice flooded and received a heavy alluvial deposit.

60. Plot 25, 1 acre, next to the camphor plot, was planted 14 by 14 feet and manured with basic slag 300 lb., nitrolim 200 lb., muriate of potash 100 lb., lime 100 lb. in the holes. The varieties are *hondarawalu*, *alukehel*, red plantain, table plantain, and *anawalu*.

61. In both plots the suckers were planted in the West Indian manner; that is, the sucker when separated from the parent is cut off near the root and laid on its side with an "eye" uppermost in a hole 2 feet deep and covered. Till the plant is nearly ready to flower all suckers are removed. When the plant is seven months old and nearing the flowering time two suckers are allowed to grow up to take the parent's place when cut down.

62. A row of each variety has been planted in the ordinary Ceylon way, the sucker left with a long stem and planted upright, and one row has been planted in hand-dug holes.

CLEARINGS.

63. The large block of 40 acres of old, neglected cocoa, which had been reserved as a possible site for the proposed Imperial College of Agriculture, is being cleared with a view to part of it being laid out in plots of economic products.

CATTLE.

64. The old herd was sold by public auction, and five pairs of Coast bulls bought to replace them for ploughing and cart work.

LABOUR.

65. This has been far from satisfactory, as there is not enough labour obtainable to keep the Station as it should be kept.

RAINFALL.

66. The rainfall has been very unevenly distributed. There was a severe drought in June soon after the north-east monsoon had broken, and in consequence a considerable number of newly-planted and sown products suffered. Heavy rains were experienced in the south-west monsoon.

67. There have been three big floods, the river rising and covering low-lying portions of the Station. The floods occurred in August, October, and December, the two latter being exceptionally high.

VISITORS.

68. His Excellency the Acting Governor and party visited the Station in August, 1913. 635 visitors have signed their names in the book, but there have been many who have not signed.

HENARATGODA.

69. The Conductor, Henaratgoda, Mr. D. F. de S. Gooneratna, reports as follows :—

Rubber Tapping Experiments.—A series of outside tree experiments were started on November 1, 1912, and continued till the end of October, 1913. Thirty-three big rubber trees of the second generation were blown down by strong winds in June, 1913. The continuation of the interval tapping experiment, viz., tapping once in five days and once in four days, was thus interrupted until the fallen trees were cleared. The amount of rubber made in different experiments by the application of coagulants for the whole period is 1,449 lb. 13 oz. of dry biscuit and scrap.

Wickham's Process of Hard Cure.—Started making smoked rubber by means of Wickham's process on July 31, 1913. Nearly 300 trees were marked on the one-third girth system to be tapped alternately. At the start the smoked films of rubber were twisted round poles, as the press was in an unfinished condition. The press being put up permanently, the making of block rubber was started on September 1, 1913. The whole area under tapping for the smoker is divided into four different parts, namely, first, second, third, and fourth plantations. The third plantation alone is tapped one day, whilst all the rest is taken on the next. The rubber smoked by the Wickham process consisted of rolled bands and pressed blocks, weighing 964 lb. 7 oz., including scrap, &c., from July, 1913, to the end of the year.

New Clearing.—The clearing of the jungle in riverside started in November, 1912. A few stumps were extracted by means of the stump extractor, but most have been removed by blasting with dynamite. Soon after clearing was finished the rubbish was heaped up and set fire to. The holes have been made at 33 feet apart; holing was done by means of dynamite, which proved an excellent process. A bit of jungle just close to the conductor's bungalow has been cleared to open a vegetable garden.

New Rubber Plantation.—Planting rubber stumps in the recently cleared 5-acre block was started in June, 1913. At 33 feet apart 45 stumps have been planted to an acre. The plants are mulched round to keep the ground moist, and are thriving well.

PUBLICATIONS.

70. The Manager assisted in compiling Bulletin No. 5 on Cocoa Manuring and Shading and the Bulletin on the "Use of Explosives in Agriculture." He contributed for the "Tropical Agriculturist" papers on Cotton Growing in Egypt; The Agricultural Bank of Egypt; Tomato Growing; and reviews on several books on Agriculture.

Peradeniya, January 20, 1914.

DUDLEY S. CORLETT,
Manager, Experiment Station.

REPORT OF THE MANAGER OF THE DRY ZONE
EXPERIMENT STATIONS.

PERSONAL.

THE Manager acted as Manager of the Experiment Station, Peradeniya, in addition to his own duties from October 1, 1912, until February 1, 1913, and at the same time supervised the rubber tapping experiments at Henaratgoda.

2. With the opening of the Dry Zone Experiment Station at Anuradhapura in August, 1913, his headquarters were transferred to that town in October, 1913, and since then he has visited Maha Illuppallama once or twice a month.

3. The appointment of a conductor for the Dry Zone Experiment Station, Anuradhapura, had not been made by the end of the year. A clerk was appointed to the office at Maha Illuppallama in the person of Mr. J. E. P. Maldeniya in September, 1912. He retired in September, 1913, and Mr. A. W. L. Samarasinha has been appointed to the post, which is now at Anuradhapura, as from January 1, 1914.

4. A coconut trial ground was opened at Chilaw on July 1, 1913, and Mr. R. D. Weerasinha was appointed to the post of conductor there. It has been necessary for the Manager to make one, and sometimes two, visits to Chilaw each month. During the months of February to May, 1913, inclusive, he made a number of journeys in the Western, Southern, and North-Western Provinces, inspecting possible sites for coconut trial grounds. In the course of these trips he visited Veyangoda, Mirigama, Galle, Matara, Chilaw, &c.

5. The Manager attended an agricultural show held at Chilaw on December 13, 1913, and also one held at Bandaragama on May 17, 1913, and assisted in the judging. He also assisted, from June 25 until July 11, at the All-Ceylon Agri-horticultural Show held in Colombo in July, 1912. During the year 1913 6,000 miles were covered by him in the course of his work.

PUBLICATIONS.

6. Bulletin No. 7: Coconut Experiments at Maha Illuppallama, was published in November, 1913.

COCONUTS.

7. The plantations at Maha Illuppallama have made good progress during the period under review. Since February, 1913, crops have been taken from some of the trees, that is to say, from Plot A. 17 acres of 5-year old trees and from Plot B. 6½ acres of 6-year old trees.

8. Now, although the number of yielding trees rose to 90 by June, yet it was not until the end of the year that there was any further increase, when it rose to 123, an increase of 36 per cent. This figure—123 yielding trees—represents but a small proportion of the trees in these plantations, and is therefore not of much consequence, but an examination of records to date of crop returns and copra outturns goes to prove a state of things which can be described as distinctly promising as regards the possibilities of coconut cultivation on a plantation scale on land under some of the large irrigation schemes in the North-Central Province.

For the last nine months of 1913 the average yield per producing tree worked out at 50 nuts on the irrigable and cultivated Plot A., and 42 nuts on the unirrigable and uncultivated Plot B., and this, too, with the omission of three good yielding months of the year.

9. The number of nuts required to produce a candy (560 lb.) of copra has varied from 1,147 to 1,393, with an average of 1,278 from the combined plots.

10. The annual census of trees which have arrived at, or are approximate to, the yielding stage, when taken in June, 1913, was as follows:—

	Age.	Yielding.	Bearing.	Flowering.
Plot A. (17 acres)	.. 5	.. 82	.. 173	.. 173
Plot B. (6½ acres)	.. 6	.. 8	.. 22	.. 40

The general condition of the plantations continues to demonstrate most clearly the benefits and advantages to be derived from frequent cultivation of the soil for young coconuts growing in dry districts.

11. The only pest requiring attention, other than the black or rhinoceros beetle, which is always present in small numbers, is the red beetle (*Rhynchophorus ferrugineus*, F.), which has accounted for a few trees. Constant attention has, however, kept it well in hand. The way in which the pest has devoted its attention, chiefly to trees on Plot B., and with fatal results far more often than in the case of affected trees on Plot A., is, I think, a sign of the lack of vitality in the case of the former, due to want of cultivation and moisture in the soil.

PADDY.

12. Previous trials at Maha Illuppallama, extending over a period of three years, have mostly been directed towards showing the advantages to be obtained from the system of transplanting, as against the local method of broadcast sowing. Now, although the advantages of the former method are considerable, namely, in the saving of seed, the increase of yield, and the economy of water, which last is of prime importance in these regions, yet there are conditions locally affecting the goiya, chiefly sparse population, which prevent the adoption of this system by him. Furthermore, the advantages of transplanting are not so marked on this rich soil as on the poor hillside soils of Kandy, for instance. At the same time, the system would be well worth the attention of paddy growers on a large scale. There being, as yet, practically no growers of this class in the North-Central Province, attention has been directed towards discovering how the yields of village crops can be improved by other means.

The opinion being pretty generally expressed that the villager uses far too much seed when sowing his fields, our trials have latterly been directed towards finding out how far this surmise is correct. An experiment on these lines was carried out early in 1912. Acre plots situated side by side were treated as follows :—

(1) Transplanted at 12 inches	..	$\frac{1}{8}$	bushel per acre.
(2) Broadcast	..	2	do.
(3) Do.	..	1	do.
(4) Do.	..	$\frac{3}{4}$	do.

A 4-months paddy called, “kaivarisamba” was used in every case. Unfortunately a severe attack of paddy bug prevented any results being obtained, beyond a further reduction in the cost of transplanting to Rs. 4 per acre.

13. A further investigation of this proposition was made the following season with 3- and also 4-months paddy. As in the previous case, acre plots were treated. The crops were sown in May and June and harvested in September. The results were :—

Kaivarisamba (4-months Paddy).				Heenativi (3-months Paddy).			
1 bushel sowing gave	37 $\frac{1}{2}$	bushels		2 $\frac{1}{2}$ bushel sowing gave	38	bushels	
$\frac{3}{4}$ Do.	38 $\frac{1}{2}$	..		2 Do.	27	..	
$\frac{1}{2}$ Do.	37	..		1 Do.	35 $\frac{1}{2}$	..	
$\frac{1}{4}$ Do.	43 $\frac{1}{2}$	..		$\frac{3}{4}$ Do.	27	..	
				$\frac{1}{2}$ Do.	37	..	

14. These results, although in no wise conclusive, indicate that considerable reductions from the usual rate of sowing 3- and 4-months paddy could be made without any appreciable reduction in crop return. Similar trials will have to be repeated many times before any definite conclusions can be arrived at.

15. Our efforts have also been directed towards introducing varieties of paddy from sources outside the Province. An introduced variety, which is being taken up to an increasing extent by cultivators under the Kalawewa-Yodi-ela scheme, is kaivarisamba—a 4-months variety. The paddy commonly grown by the villagers is heenativi—a 3-months variety. This kaivarisamba paddy, which has repeatedly given excellent results at our trials, is a hardy variety, giving a white rice of superior quality.

16. Should it come about that schemes mature which have as their object the production of estate cooly rice from lands within this Province, I think that in kaivarisamba growers will have the kind of paddy they require.

17. In the hope of introducing some kind of 3-months paddy which would prove superior to the local heenativi, the following trial was carried out in the maha season of 1913. Acre plots were treated as before, and in each case two bushels of seed were sown broadcast :—

Name of Variety.	District of Origin.	Yield per Acre.		Bushel Weight of Grain.	Age.
		Paddy.	Straw.		
		Bushel.	Cwt.	lb.	Months.
Kantiribalamavi	.. Galle ..	48 $\frac{1}{2}$	15 $\frac{1}{2}$	42 $\frac{1}{2}$	3 $\frac{1}{2}$
Heenativi	.. Ambalangoda	43 $\frac{1}{2}$	16 $\frac{1}{2}$	43 $\frac{1}{2}$	3
Marandanivi	.. Kurunegala	42	18	47 $\frac{1}{2}$	3
Heenativi	.. North-Central Province	41	22 $\frac{1}{2}$	52	3
Suduratavi	.. Galle ..	41	13 $\frac{1}{2}$	45 $\frac{1}{2}$	3
Balavi	.. Henaratgoda	38 $\frac{1}{2}$	18 $\frac{1}{2}$	47 $\frac{1}{2}$	2 $\frac{1}{2}$
Kirinaranvi	.. Matara ..	38	20 $\frac{1}{2}$	36 $\frac{1}{2}$	3 $\frac{1}{2}$
Nanduheenativi	.. Galle ..	37 $\frac{1}{2}$	17 $\frac{1}{2}$	42 $\frac{1}{2}$	3
Murungavi	.. Kurunegala	27 $\frac{1}{2}$	14 $\frac{1}{2}$	45 $\frac{1}{2}$	3

As can be seen from the table of results, this object was not achieved. However, in most cases the yields were well above the average yields of the paddies in their respective districts. An interesting feature was that in the case of three varieties there was a variation in the age.

SISAL HEMP.

18. Growing on unirrigable land. The plants have arrived at the poling stage—at an age of rather more than four years from the time they were planted out as small suckers 9 inches in height. The growth of the plot has been quite regular, the plants being very little affected by the dry seasons. The leaves of the plants have reached an average length of 4 feet 6 inches to 5 feet. The rather premature poling has, I think, been induced by the quantity of suckers which were left growing at the base of the plants. These suckers were not removed, in the first place, owing to an insufficiency of labour, and subsequently owing to the difficulty experienced in removing them, rendering the cost prohibitive.

PINEAPPLES.

19. Two plots, 1-100th of an acre each, were in November, 1912, laid out with pineapple suckers: one plot of Kew, and the other of Mauritius pines. The pines were grown under light shade, and were also irrigated whenever necessary. Good crops of fruit were obtained during the months of March to June inclusive of the following year. Of the two varieties, the Kew proved more satisfactory, the fruits being altogether larger and better flavoured.

CITRUS FRUITS.

20. A number of orange, tangarine orange, and pumelo trees, planted out on unirrigable land in April, 1907, have just started producing fruit, *i.e.*, at seven years of age.

CASTOR OIL.

21. In October, 1911, 1 acre was sown with red erundi (the seed being derived from a small plot grown the previous year from seed obtained from India). Owing to excessive rains during the early stages of growth the crop did not develop satisfactorily, and not more than 10 bushels of seed were collected in 1912. The crop was left standing for a second year, but only 6 bushels of seed were obtained in 1913. A marked feature of the trial was the way in which the seed deteriorated as regards size. It would appear that the crop must be grown as an annual one if the original quality of the seed as regards size is to be retained, as the plant, with age, rapidly reverts to the wild type. Given a ready market, and it is apparently to be found in connection with the tea industry, there seems no reason why the cultivation of the castor oil plant, treated as an annual crop, and with careful seed selection, should not prove a profitable occupation for village cultivators in the North-Central Province.

COTTON.

22. Ten acres sown with Allan's long-stapled Upland with the rains in October, 1912, gave indifferent results, owing to excessive and prolonged rains which fell in January, 1913 (12·40 inches falling, whereas the normal rainfall does not exceed 2 inches). A return of 220 lb. of seed cotton was obtained. Two acres sown with Sakkelarides Egyptain gave a return of 228 lb. of seed cotton. This cotton was also affected by the rains, though not to the same extent.

RAINFALL AT MAHA ILUPPALLAMA.

		1912.	1913.	Average for 6 Years 1906-1911, inclusive.
January	..	0·04	12·40	2·90
February	..	—	2·97	2·08
March	..	1·85	1·64	2·95
April	..	5·04	7·06	5·51
May	..	1·58	0·39	1·72
June	..	6·58	0·89	1·45
July	..	0·03	3·45	2·36
August	..	1·69	0·03	2·48
September	..	1·47	0·17	1·99
October	..	7·67	16·28	11·66
November	..	8·30	6·59	9·91
December	..	3·12	8·12	10·19
Total	..	37·37	59·99	55·20

23. The years have both been good ones from an agricultural point of view, the falls of rain during both the north-east monsoons having been above the average. Also, there was not much protracted drought.

PRODUCTS OF THE DRY ZONE.

24. With reference to the possibilities of profitable agriculture in the North-Central Province for the planter, whether European or Ceylonese, with some capital behind him (and I believe that only by inducing some agriculturists of this kind to take up land in the Province can the poor cultivator or goiya be gradually raised to a state of prosperity and agricultural enlightenment), the one crop which is really showing promise of being a highly profitable one to grow is coconuts.

25. Fruit growing and the cultivation of fibre-producing plants should prove useful as auxiliaries to the main coconut crop.

26. Sisal hemp, although it has not yet actually proved itself, has at any rate given results sufficiently encouraging to justify a further trial, and would be a suitable crop for planting on the high unirrigable ridges of lands bordering on the irrigable coconut lands.

27. Pineapple and plantain growing, given a suitable and handy market, is well worth attention, and I believe that the same will come to be said of mango and citrus fruit growing, although there is, as yet, no reliable data to go upon.

28. Paddy growing is well worth the attention of agriculturists, even if the sole object is the production of a high grade and economical food stuff for estate coolies. There is no reason why the crop should not earn a direct profit as well, though to what extent depends on many things, amongst others, the class of paddy grown, the extent of the water supply, the conditions and arrangements under which the crop is grown.

29. Not much can be said in favour of cotton growing in the North-Central Province. It is too uncertain a crop, due chiefly to the prevalence of abnormal and unsettled weather and insect pests. At the same time it is a crop which the small cultivator might well be encouraged to grow as a pure rotation crop on his high lands, but not as a mixed crop amongst his so-called chena crops.

ANURADHAPURA.

30. This new station was opened in August, 1913. The land selected for the purpose lies $2\frac{1}{2}$ to 3 miles from Anuradhapura on the great North road, which road forms its eastern boundary. It is situated close to the ancient monastery of Puliankulama, and the main Northern Railway line runs through the middle of it. For the sake of future reference, that portion of the land lying east of the railway, and between it and the Jaffna road, will be called Block A, and that portion lying west of the railway will be called Block B. The area of the land is 90 acres at present, but it can be extended in a westerly direction to very many times its present size. This land was acquired for the use of this Department through the good will of Bulankulama Ratemahatmaya, to whom it belonged, and who very considerably consented to exchange it for another block. The experimental block of land, when it was taken over by Government, consisted for the most part of good average-sized jungle. This applies more particularly to Block B.

31. Of Block A, the lower portion had been chenaed within recent years, while the upper portion had been under-brushed, with a view to its being chenaed, but for some reason a crop had not been taken from it.

32. The tree growth consisted largely of veera, with a number of buruta (satinwood), palu, and kaluwara (ebony), but most of the serviceable timber had been removed.

33. *Progress Report.*—Fourteen acres of jungle at the upper end of Block A were felled and well cleared during August and September, 1913. Four acres of this area were freed from stumps by the end of the year. Fifteen mud and wattle cooly rooms have been built and are in occupation; some temporary rooms have also been erected. A cattle shed to hold three pairs of Coast bulls has been constructed, and also a mud and wattle store consisting of three rooms. A round-post and barbed wire fence is in course of erection enclosing Block A. A labour force of 80 coolies, consisting of both Indian and Jaffna Tamils, men and women, has been established.

COCONUT TRIAL GROUND, CHILAW.

34. This trial ground was opened on July 1, 1913. The original site selected was a block 20 acres in extent of 12 to 20-year old trees, situated on Millicent estate—one of the group of estates forming what is known as Martin Coconut Estates of Chilaw, Limited. This block of land was lent to the Department on certain terms for the purpose of carrying out various experiments. As regards the selection of a suitable site, the Department is much indebted to Mr. N. J. Martin, who, with the concurrence of his co-directors, put every facility in our way. Unfortunately, after the lapse of a few months, the original site had to be abandoned owing to the Puttalam railway trace running through it, and a fresh site, also on Millicent estate, was chosen. This site, as compared with the original one, has the advantage of being half a mile closer to the town, but there is a reduction in the acreage, the block being one of 15 acres only. Also, there is a slight increase in the average age of the trees.

35. A scheme of experimental work has been drawn up. The block of land has been divided up into acre plots. Necessary buildings of a temporary nature are being erected. A barbed wire fence is being constructed for the purpose of separating the plots from the rest of the Millicent estate.

G. HARBORD,
Manager.

REPORT OF THE SECRETARY, BOARD OF CONTROL, CO-OPERATIVE CREDIT SOCIETIES.

STAFF.

MR. R. N. LYNE, the Director of Agriculture, was appointed, in addition to his own duties, Registrar of Co-operative Credit Societies from February 15, 1913, *vice* the Hon. Mr. P. Arunachalam (now Sir P. Arunachalam), Registrar-General.

2. A Board called the Board of Control, Co-operative Credit Societies, to control the Government loans to societies, consisting of the Hon. the Treasurer (Chairman), the Hon. the Government Agent, Western Province, the Hon. the Government Agent, Central Province, and the Registrar of Co-operative Credit Societies, was appointed from the same date.

3. Mr. N. Wickramaratne, a Senior Agricultural Instructor of the Ceylon Agricultural Society, was appointed Secretary to the Board of Control on April 1, 1913.

4. Mr. S. V. Solomons of the Public Works Department was appointed clerk from July 14, 1913.

5. Mr. A. M. Muttukumaru, late of the Sanitary Board Department, Kuala Lumpur, was appointed Tamil Inspector of Co-operative Credit Societies in December, 1913.

EXPEDITIONS.

6. The Registrar has travelled in all the Provinces, and addressed meetings or held conferences at the Ratnapura, Galle, Trincomalee, Batticaloa, Puttalam, Mannar, and Badulla Kachcheries, and at Bandaragama, Harispattu, Tamankaduwa, Murungan, and Henaratgoda, on Co-operative Credit Societies.

7. Mr. C. Driberg, Superintendent, Low-country Products and School Gardens, and Secretary, Ceylon Agricultural Society, has addressed a number of meetings and published a pamphlet on Co-operative Credit Societies.

8. The Secretary has attended 52 meetings and conferences at forty different centres in all the Provinces, except the Northern Province.

9. In May last the Director of Agriculture addressed the officers of the various sub-departments and of the Ceylon Agricultural Society on the subject of Co-operative Credit Societies at the Library at Peradeniya. All the Agricultural Instructors were detailed off for two months to travel about in their respective districts and speak to the people on Co-operative Credit Societies, and to diffuse knowledge of the movement. They received the co-operation of the Government Agents, Assistant Government Agents, the Chief and Minor Headmen in arranging meetings and conferences in all parts of the Island where they travelled.

SOCIETIES.

10. Societies have been formed in all the Provinces of the Island, 31 having been registered to the end of December, 1913. Of these, only three societies had been registered before February, 1913. The following is the list :—

Registered No.	Name of Society.	Proposed Capital. Rs.	District.	Province.
1 ..	The Wellaboda Pattu ..	4,000 ..	Galle ..	Southern
2 ..	The Hinidum Pattu ..	1,000 ..	do. ..	do.
3 ..	The Weligam Korale ..	2,000 ..	Matara ..	do.
4 ..	The Galboda and Kinigoda ..	10,000 ..	Kegalla ..	Sabaragamuwa
5 ..	The Puttalam ..	1,000 ..	Puttalam ..	North-Western
6 ..	The Akminana ..	2,000 ..	Galle ..	Southern
7 ..	The Galle Gangaboda Pattu ..	1,000 ..	do. ..	do.
8 ..	The Magam Pattu ..	5,000 ..	Hambantota ..	do.
9 ..	The Harispattu ..	1,000 ..	Kandy ..	Central
10 ..	The Nanaddan West ..	500 ..	Mannar ..	Northern
11 ..	The Nanaddan East ..	500 ..	do. ..	do.
12 ..	The Mantai South ..	500 ..	do. ..	do.
13 ..	The Tellippalai ..	1,000 ..	Jaffna ..	do.
14 ..	The Henaratgoda ..	10,000 ..	Colombo ..	Western
15 ..	The Uva ..	1,000 ..	Badulla ..	Uva
16 ..	The Three Korales ..	5,000 ..	Kegalla ..	Sabaragamuwa
17 ..	The Walapane ..	1,000 ..	Nuwara Eliya ..	Central
18 ..	The Copay ..	1,000 ..	Jaffna ..	Northern
19 ..	The Mantai North ..	1,000 ..	Mannar ..	do.
20 ..	The Talpe Pattu ..	10,000 ..	Galle ..	Southern
21 ..	The Tamankaduwa ..	1,000 ..	Anuradhapura ..	North-Central
22 ..	The Kandaboda Pattu ..	2,000 ..	Matara ..	Southern
23 ..	The Handapangoda ..	500 ..	Kalutara ..	Western
24 ..	The Batticaloa District ..	25,000 ..	Batticaloa ..	Eastern
25 ..	The Tampiluville ..	1,000 ..	do. ..	do.
26 ..	The Hiriya Hatpattu ..	1,000 ..	Kurunegala ..	North-Western
27 ..	The Uda Hewaheta ..	2,000 ..	Nuwara Eliya ..	Central
28 ..	The Galagedara ..	500 ..	Kandy ..	do.
29 ..	The Uduppiddi Parish ..	5,000 ..	Jaffna ..	Northern
30 ..	The Medagama ..	500 ..	Badulla ..	Uva
31 ..	The Makulla ..	500 ..	do. ..	do.

Total—Rs. 98,500

From the above list it will be seen that societies have been formed in remote places, where they are greatly needed. The Batticaloa is intended for a central society to finance smaller societies subsequently to be formed in the district. A few of the societies, especially those in the Tamil districts, have not yet come into proper working order, but it is hoped with the appointment of the Inspector these will begin work. In addition to the above societies, there are at present about 21 projected societies, making in all 52 formed and forming.

SPECIMEN BY-LAWS.

11. A set of specimen by-laws for the use of societies was prepared in consultation with the Hon. the Attorney-General. Printed copies will shortly be available for general use.

GOVERNMENT LOANS.

12. So far no application has been received from societies for Government loans. This is no doubt due to the fact that the societies do not come to the Government for help until their own funds are nearly all utilized.

BOOKS AND FORMS.

13. A number of new forms and books necessary for working these societies had to be prepared. These are now available at this office. The forms were printed at the Government Press. The necessary books, such as Pass Books, Members' Register, Cash Books, Ledgers, &c., were supplied free of cost to the societies through the generosity of Mudaliyar A. E. Rajapaksa of Negombo and Mr. P. Covis Appuhamy of Hikkaduwa, who placed at the disposal of the Registrar Rs. 250 and Rs. 100 respectively for supplying them. This considerably facilitated the work, as otherwise the societies had no available funds to meet the required expenditure at the beginning.

GENERAL.

14. Considerable energy and perseverance are required in furthering a movement like this quite new to the people, and many doubts have to be removed from their minds, especially in the more inaccessible parts of the country, before they realize the value of the movement. On the other hand, it has been the experience that when a man comes to understand the real situation, and is convinced of the good of the movement, he becomes a firm supporter of his society.

15. The Secretary has during the period under review done his best to attend to all calls from the people. He has also found that owing to many appointments for meetings falling on the same day, meetings had either to be postponed or the dates altered, thereby inconveniencing parties concerned. It is hoped that with the appointment of the Inspector for Tamil districts his work in such districts will be facilitated. It has been decided to do the auditing of the societies' accounts by this Department.

16. Among the societies established three are the outcome of private enterprise, while all the others are in one way or another connected with Government officials or headmen.

17. The "Govikam Sangarawa," the Sinhalese magazine of the Ceylon Agricultural Society, has devoted columns of its pages for the diffusion of knowledge on Co-operative Credit Societies. The press in devoting space to popularize the movement has contributed largely to its success. A full report of the work will be available after April next, which starts the financial year of the societies.

N. WICKRAMARATNE,
Secretary, Board of Control, Co-operative Credit Societies.
